



**Environmental Impact Statement for the  
Seminoe Road Natural Gas  
Development Project  
Carbon County, Wyoming**

# FIGURES



HD  
243  
.W8  
S46  
2005  
v.2  
c.2

N 2005

BLM

Wyoming State Office — Rawlins Field Office



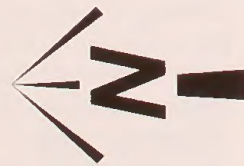
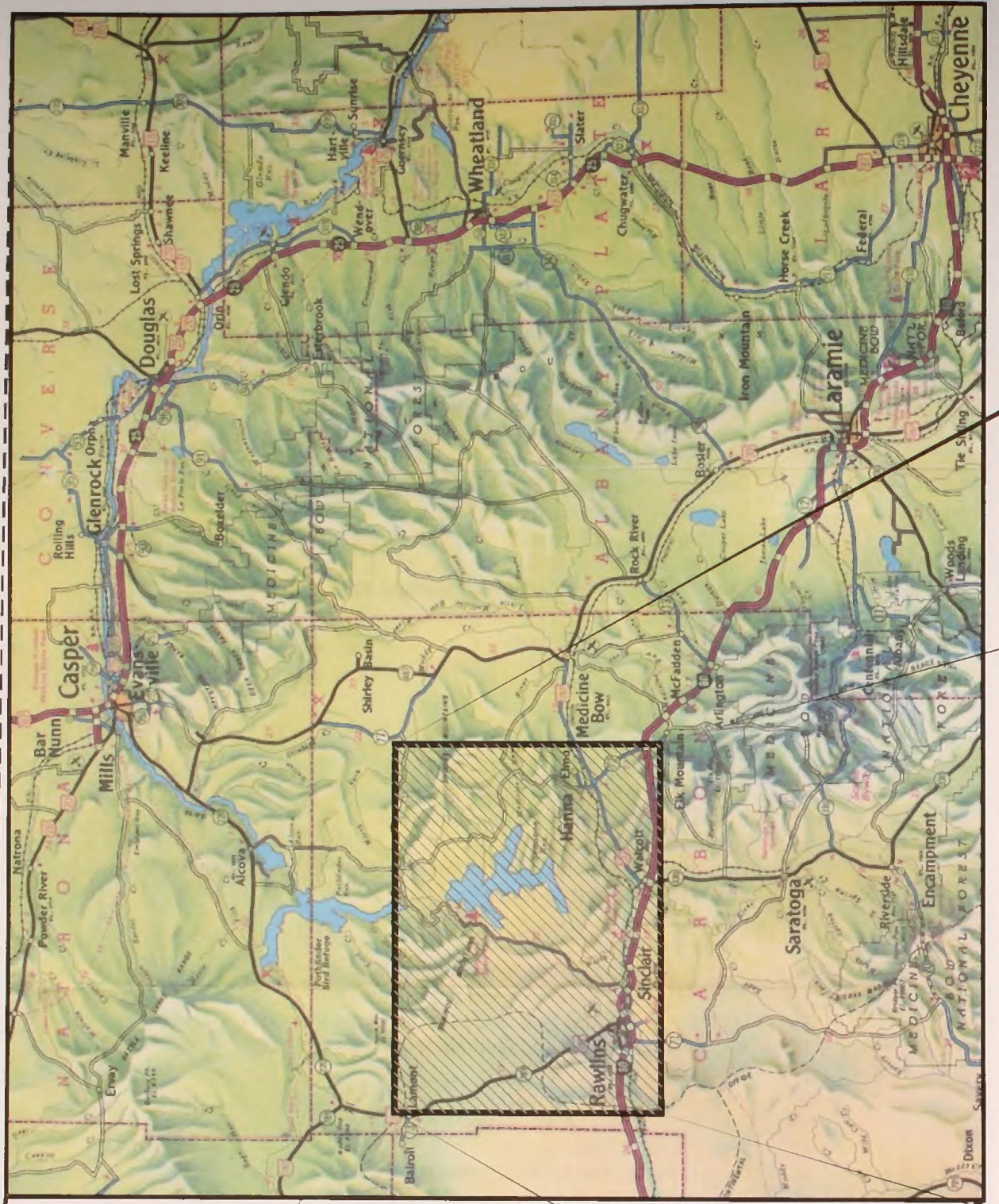




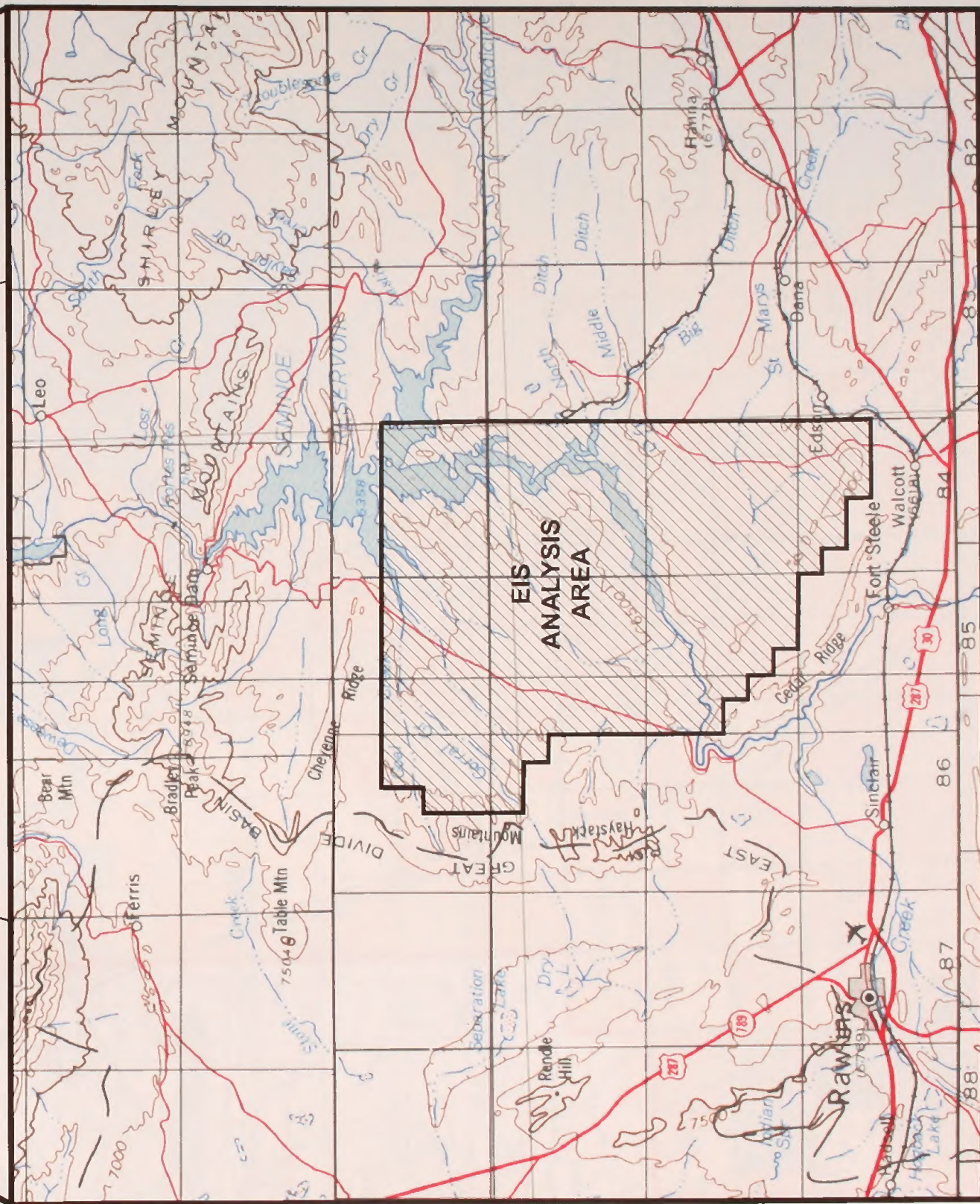
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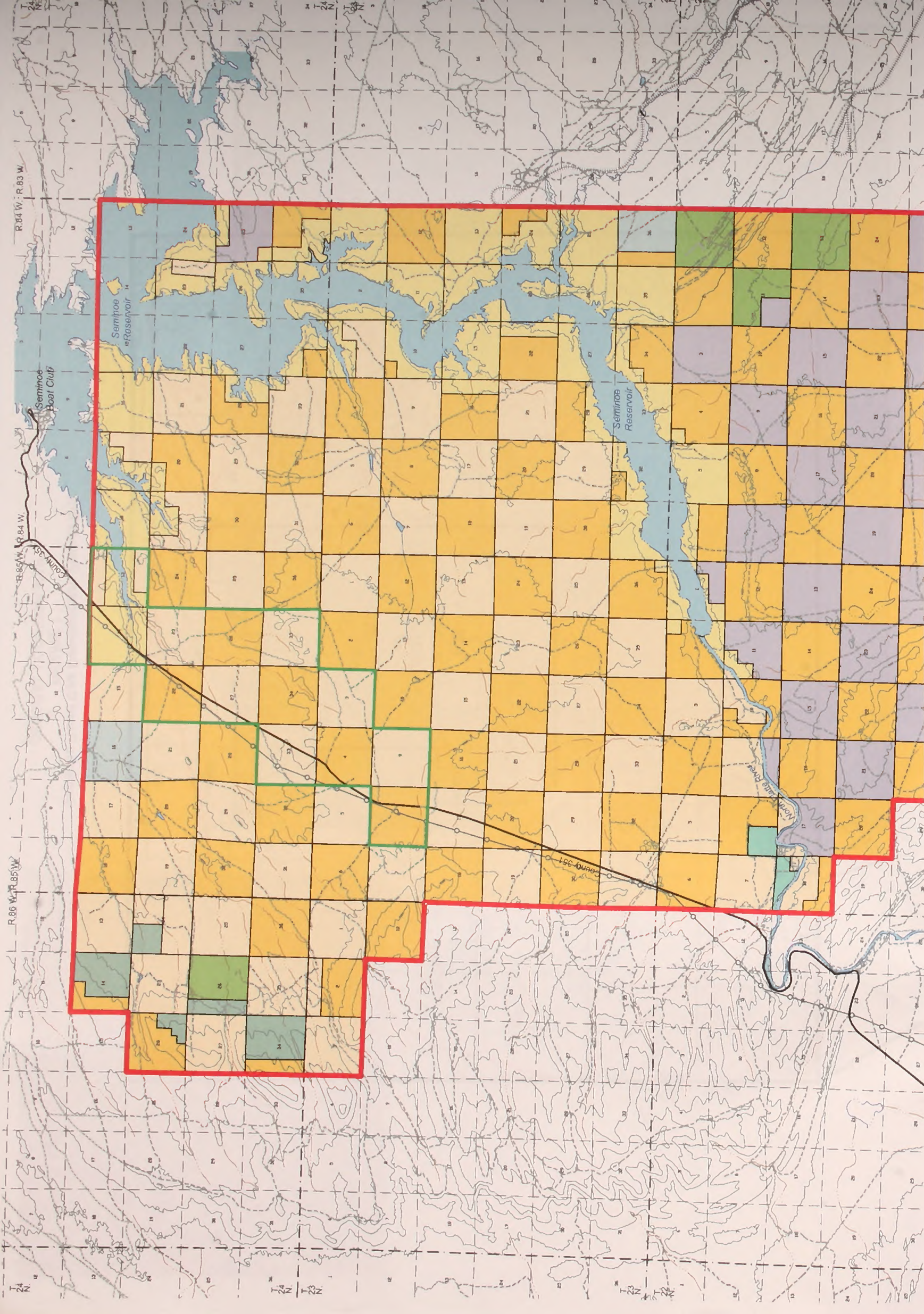




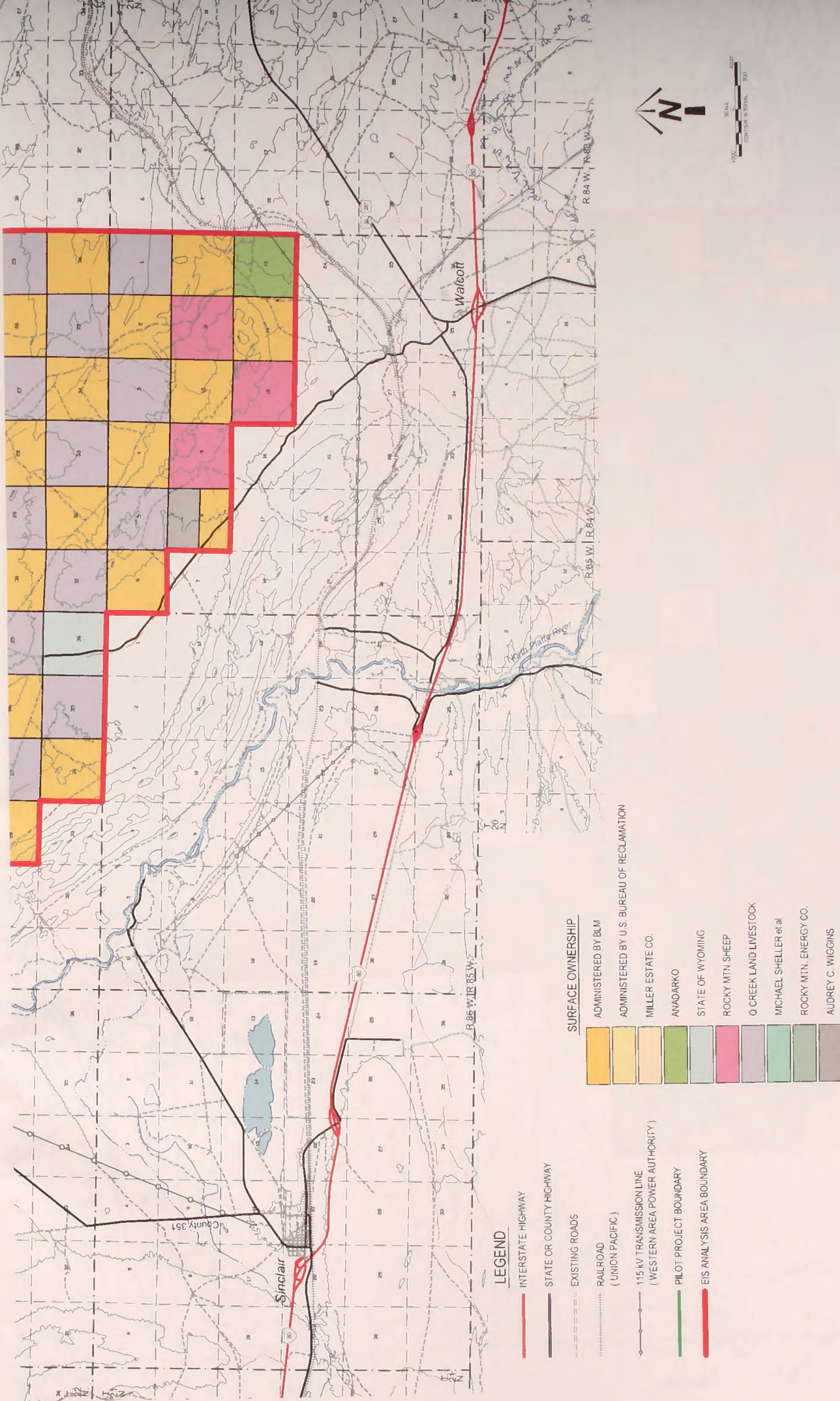


Seminole Road Gas Development Project EIS  
FIGURE 1  
GENERAL LOCATION MAP



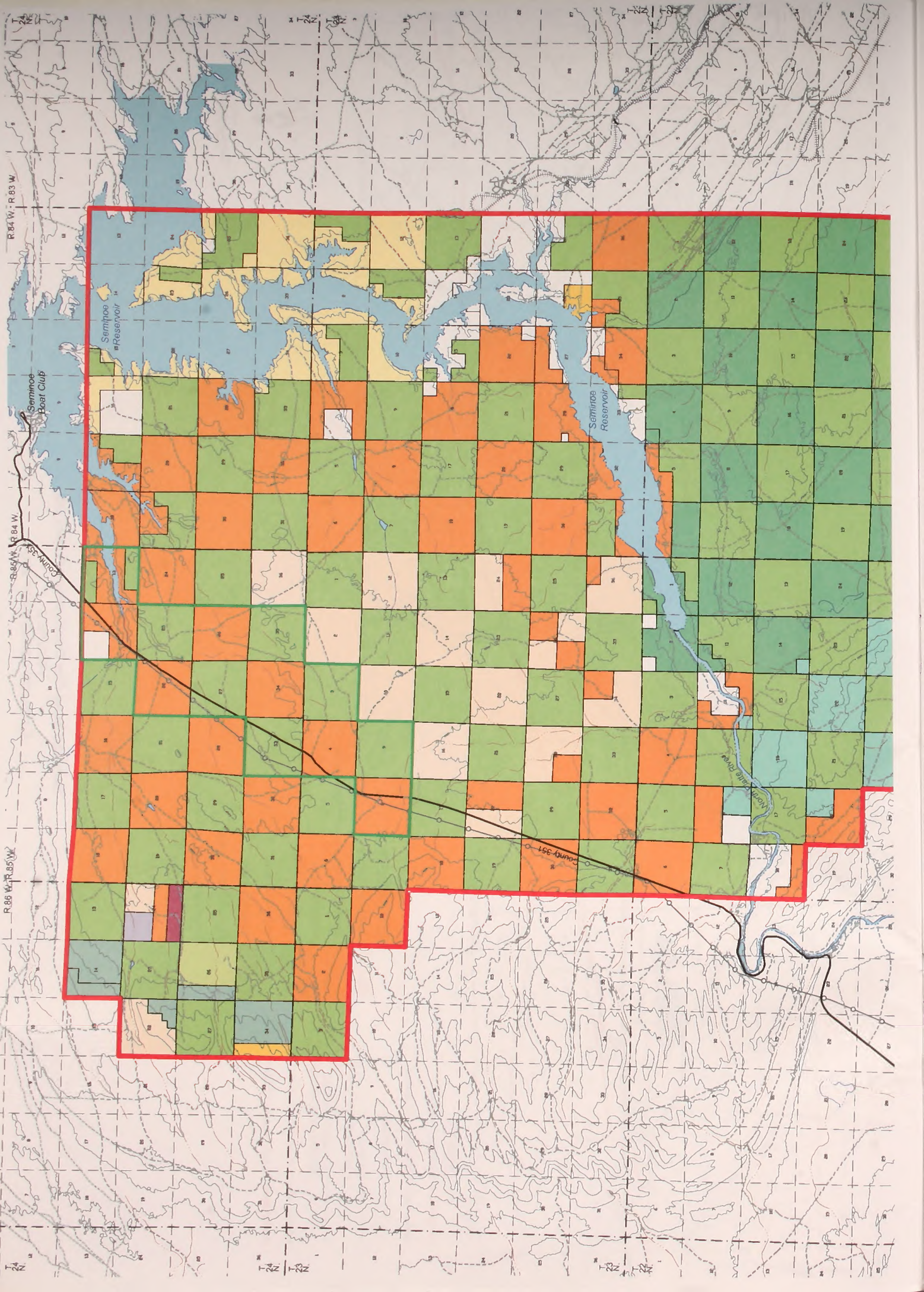




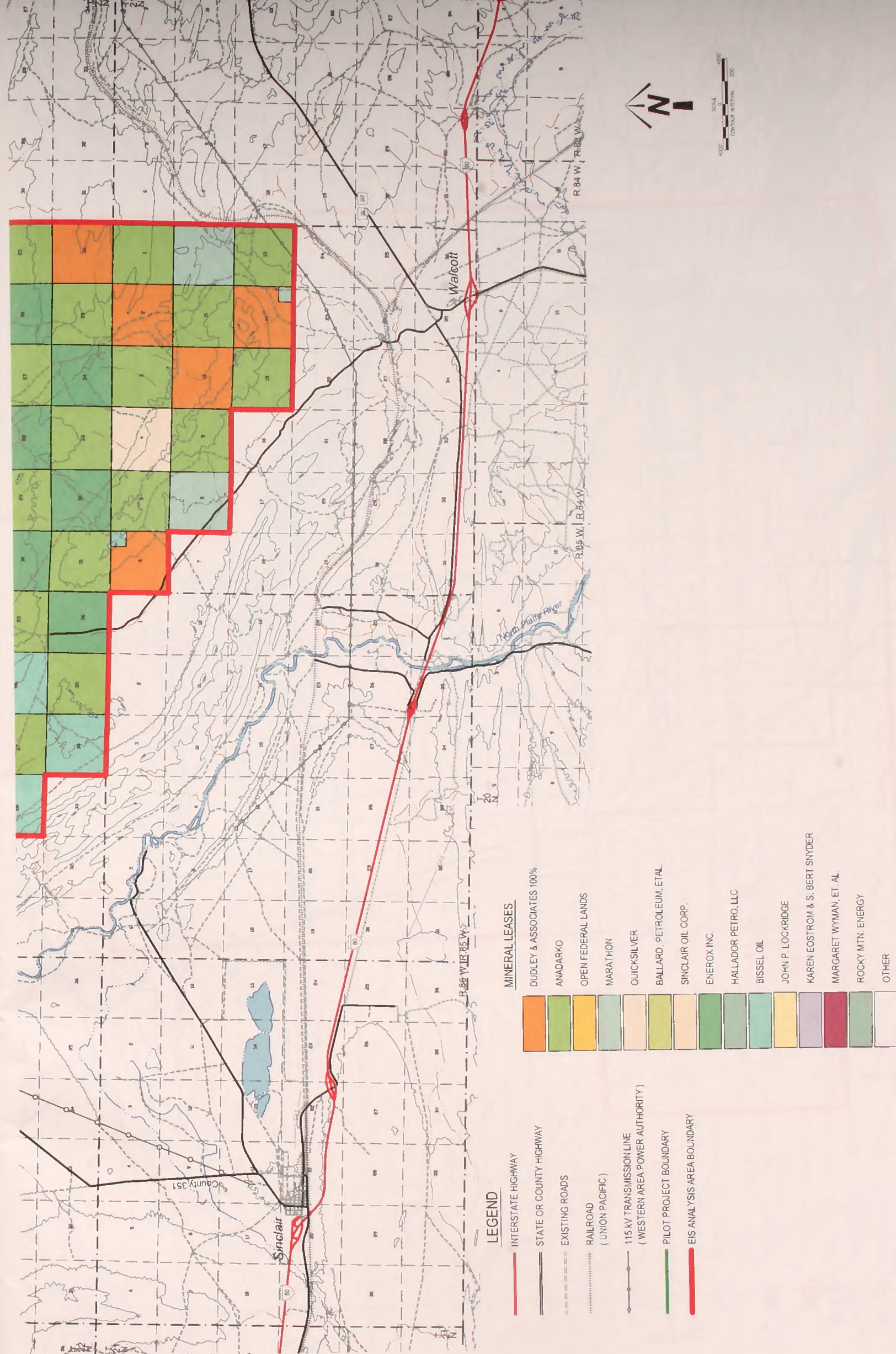


Seminole Road Gas Development Project EIS  
 FIGURE 2  
 SURFACE OWNERSHIP MAP



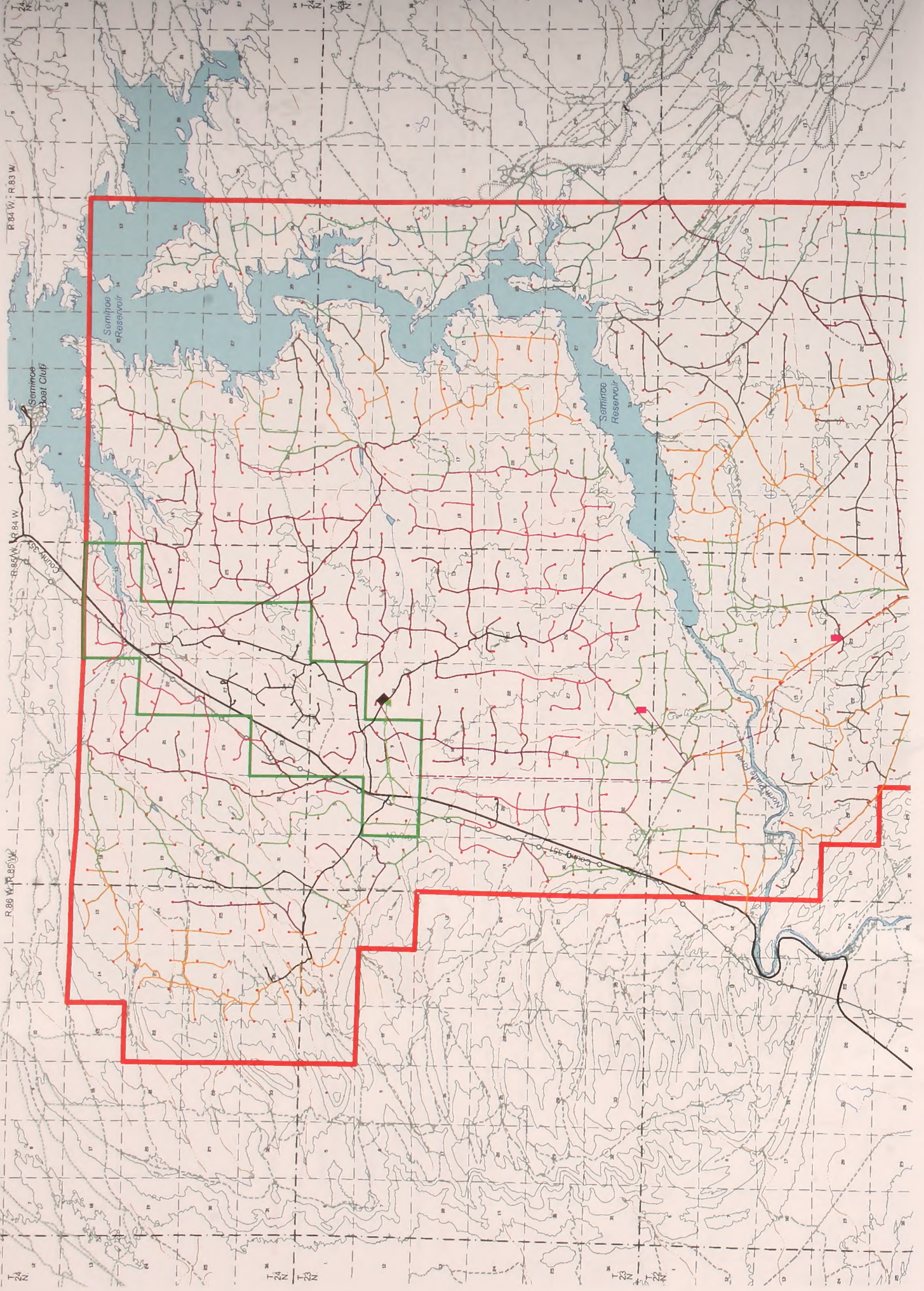
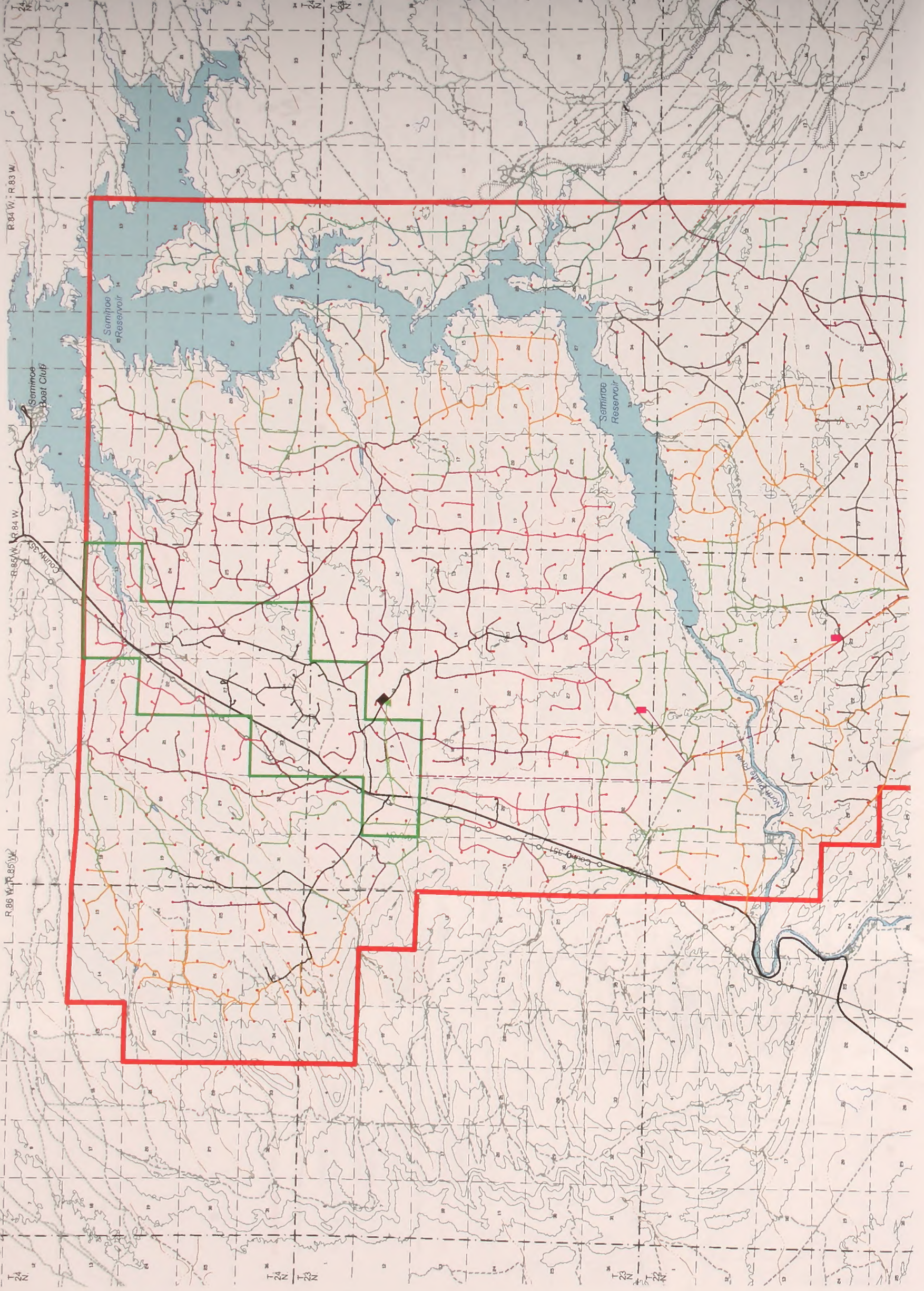




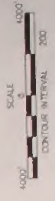
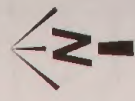
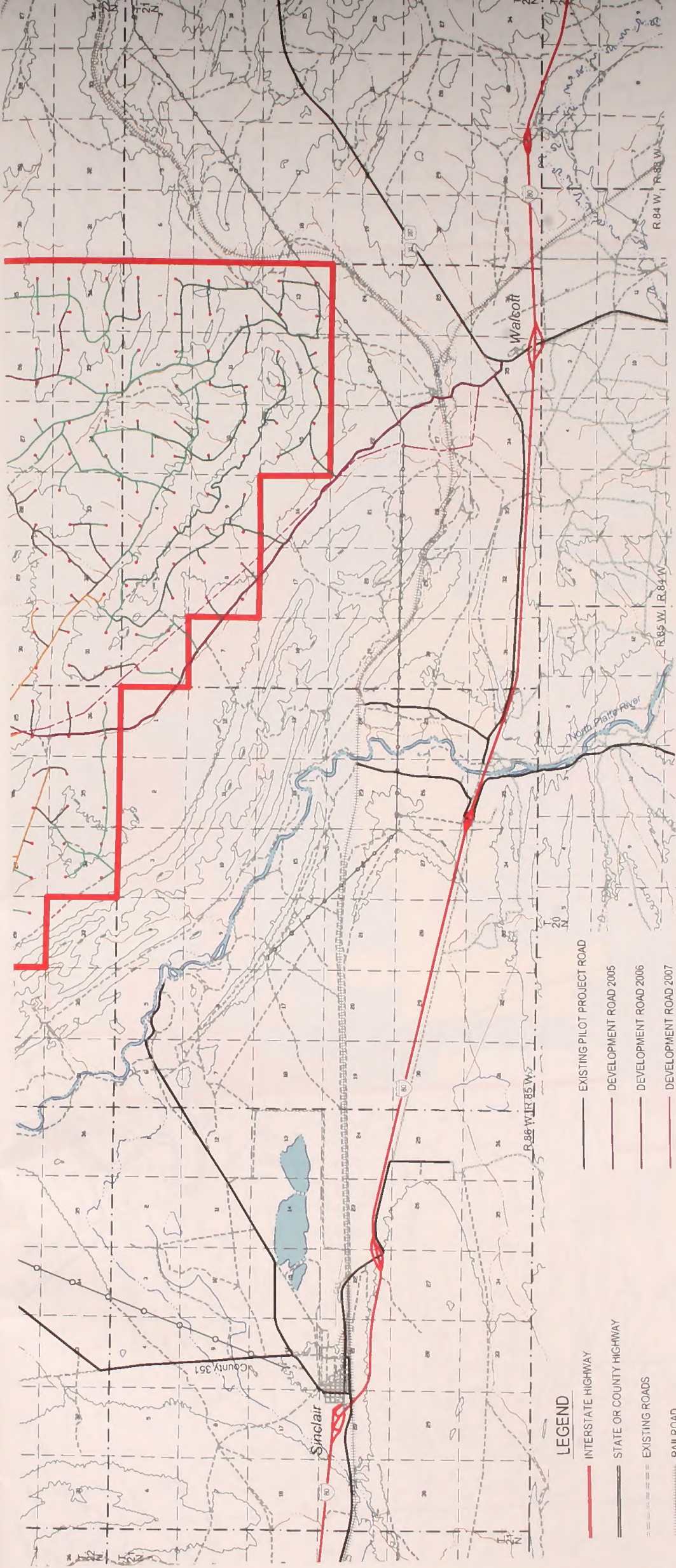


Seminole Road Gas Development Project EIS  
**FIGURE 3**  
 MINERAL (OIL & GAS) LEASE MAP









# LEGEND

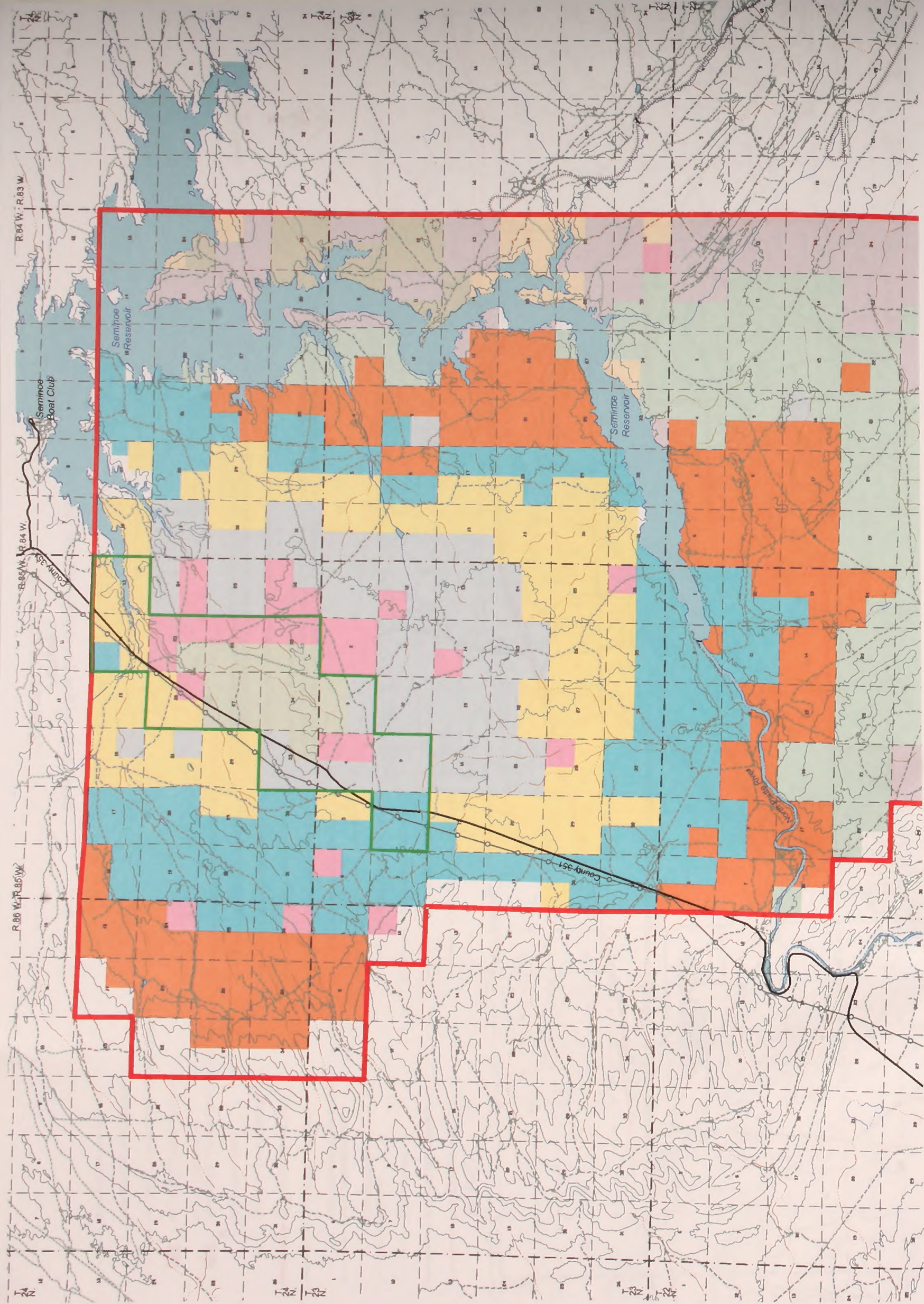
- INTERSTATE HIGHWAY
- STATE OR COUNTY HIGHWAY
- EXISTING ROADS
- RAILROAD (UNION PACIFIC)
- 115 kV TRANSMISSION LINE (WESTERN AREA POWER AUTHORITY)
- PILOT PROJECT BOUNDARY
- EIS ANALYSIS AREA BOUNDARY
- DUDLEY WELL (PILOT PROJECT)
- DEVELOPMENT WELL
- COMPRESSOR LOCATION (PILOT PROJECT - APPROVED BUT NOT CONSTRUCTED)
- PROPOSED COMPRESSOR LOCATION
- GAS PIPELINE (APPROVED BUT NOT CONSTRUCTED)
- PROPOSED ELECTRIC SUBSTATION
- NEW 115 kV LINE TO SUBSTATION
- EXISTING PILOT PROJECT ROAD
- DEVELOPMENT ROAD 2005
- DEVELOPMENT ROAD 2006
- DEVELOPMENT ROAD 2007
- DEVELOPMENT ROAD 2008
- DEVELOPMENT ROAD 2009
- DEVELOPMENT ROAD 2010
- DEVELOPMENT ROAD 2011
- DEVELOPMENT ROAD 2012
- DEVELOPMENT ROAD 2013
- DEVELOPMENT ROAD 2014

## NOTES

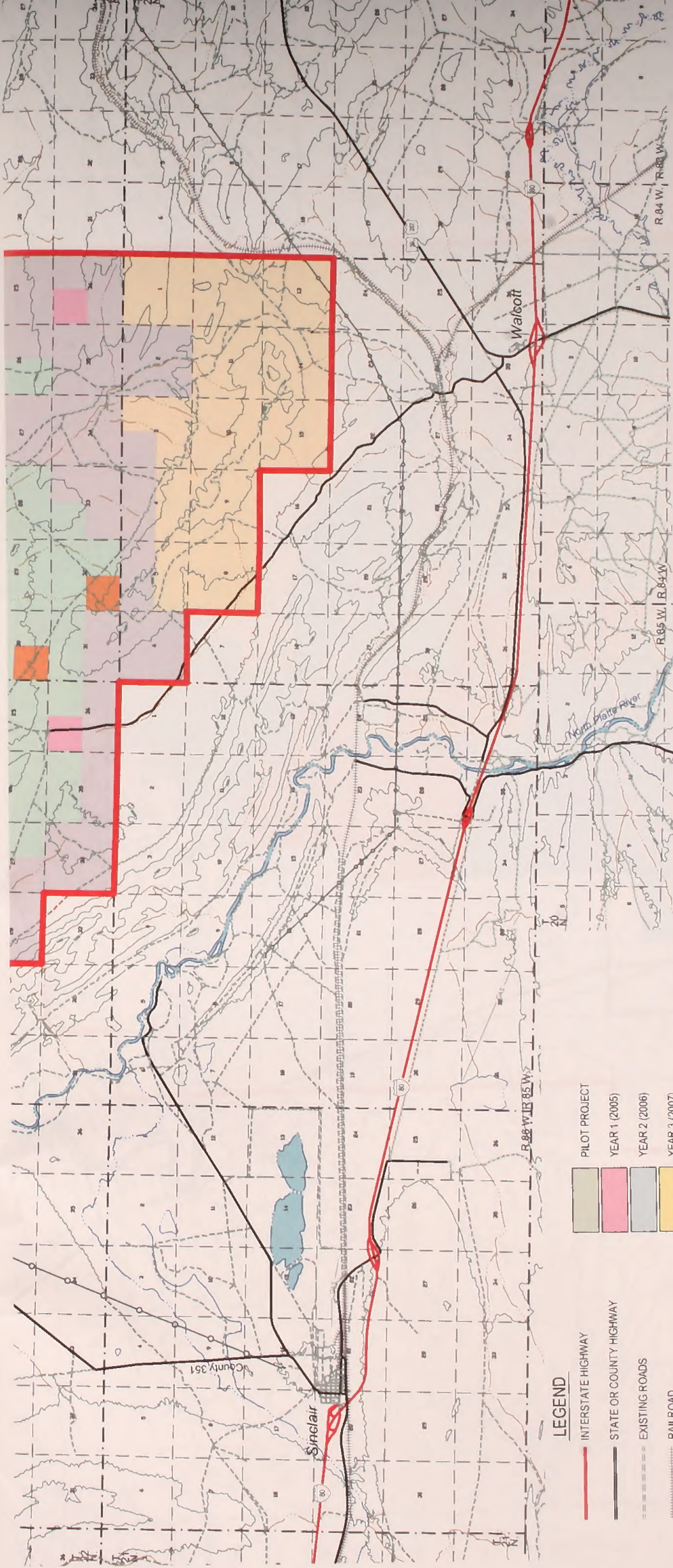
- 1) THE U.S. BUREAU OF RECLAMATION MAINTAINS A 500 FOOT BUFFER AROUND THE HIGHWATER MARK OF SEMINOLE RESERVOIR. NO ROADS AND DRILL PADS WOULD BE CONSTRUCTED WITHIN THE BUFFER ZONE WITHOUT PRIOR APPROVAL FROM BUREAU OF RECLAMATION
- 2) THIS ROAD AND WELL DEVELOPMENT SCHEMATIC REPRESENTS THE MAXIMUM POSSIBLE BUILD-OUT OF THE PROJECT.
- 3) THIS MAP ILLUSTRATES TENTATIVE AND CONCEPTUAL ROAD AND WELL PAD LOCATIONS. THE PROponent WOULD SUBMIT ACTUAL PLANS TO BLM FOR EACH PHASE FOR FINAL APPROVAL.

Seminole Road Gas Development Project EIS  
 FIGURE 4  
 GENERAL LAYOUT MAP







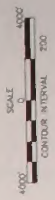


# LEGEND

- INTERSTATE HIGHWAY
  - STATE OR COUNTY HIGHWAY
  - EXISTING ROADS
  - RAILROAD (UNION PACIFIC)
  - 115 KV TRANSMISSION LINE (WESTERN AREA POWER AUTHORITY)
  - PILOT PROJECT BOUNDARY
  - EIS ANALYSIS AREA BOUNDARY
- | PILOT PROJECT | YEAR 1 (2005) | YEAR 2 (2006) | YEAR 3 (2007) | YEAR 4 (2008) | YEAR 5 (2009) | YEAR 6 (2010) | YEAR 7 (2011) | YEAR 8 (2012) | YEAR 9 (2013) |
|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
|               |               |               |               |               |               |               |               |               |               |

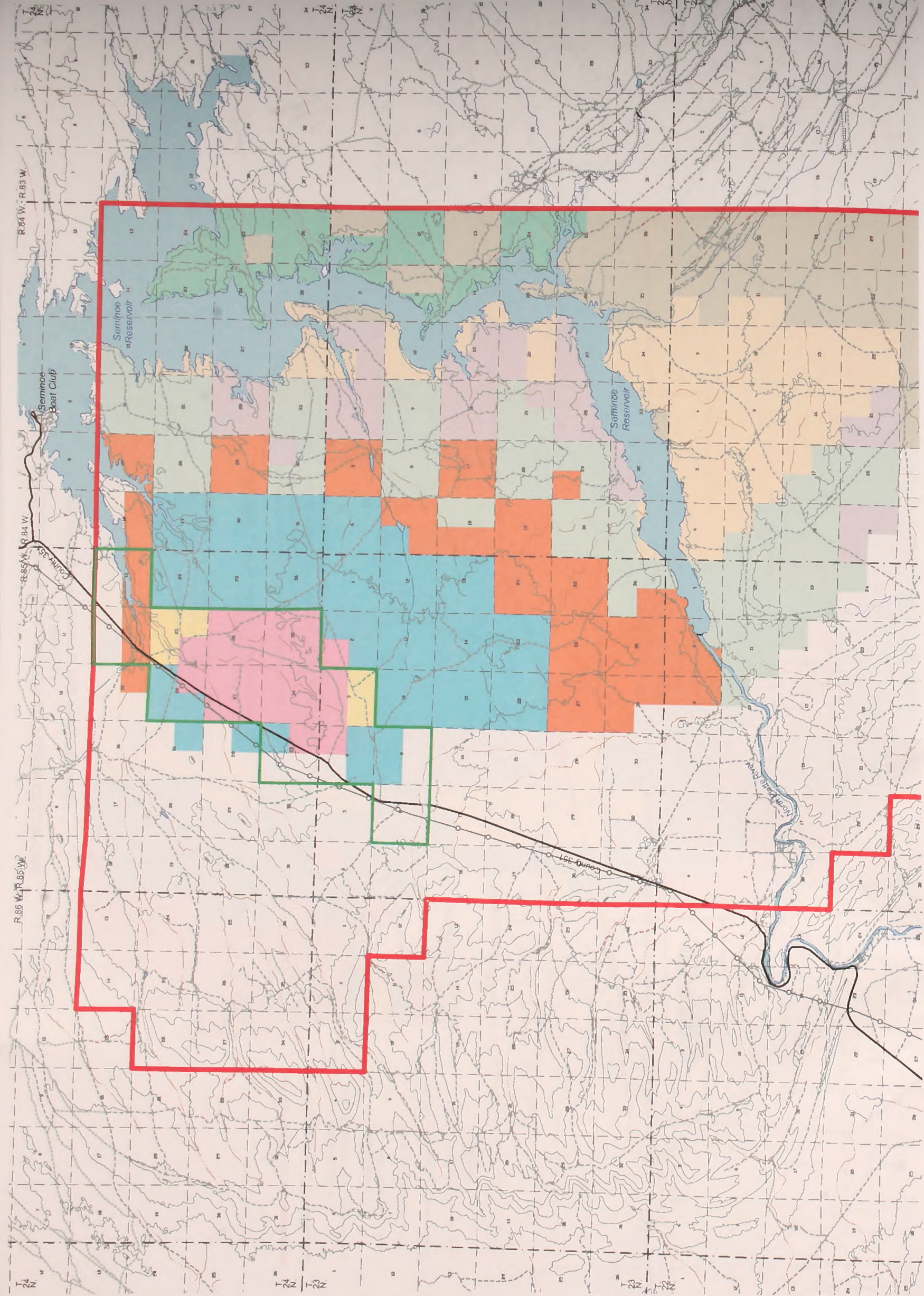
## NOTES

- (1.) DRILLING WOULD GENERALLY PROGRESS OUTWARD FROM THE PILOT PROJECT AREA, HOWEVER, CERTAIN OUTLYING AREAS WOULD BE DRILLED FOR EXPLORATION PURPOSES OR FOR DUE DILIGENCE ON CERTAIN LEASES
- (2.) NO DRILLING PLANNED IN WHITE (NON-COLORED) AREAS FOR MESASVERDE FORMATION.
- (3.) THIS MAP ILLUSTRATES A CONCEPTUAL BUILD-OUT PLAN FOR EIS PURPOSES. THE PROPONENT WOULD SUBMIT ACTUAL PLANS TO THE BLM FOR EACH PHASE FOR FINAL APPROVAL.

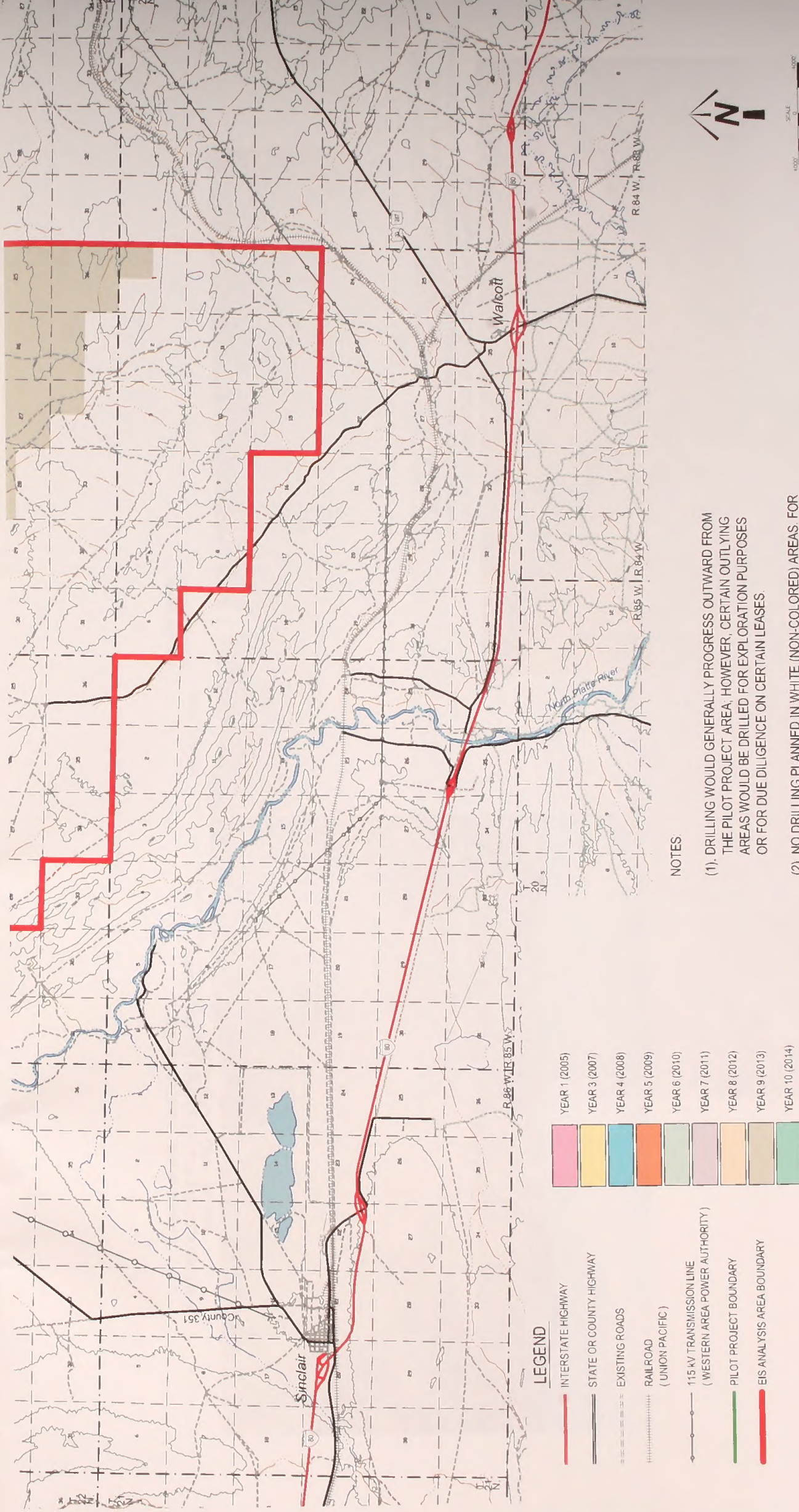


Seminole Road Gas Development Project EIS  
**FIGURE 5**  
 PROJECTED BUILD-OUT SCENARIO (MESASVERDE FORMATION)



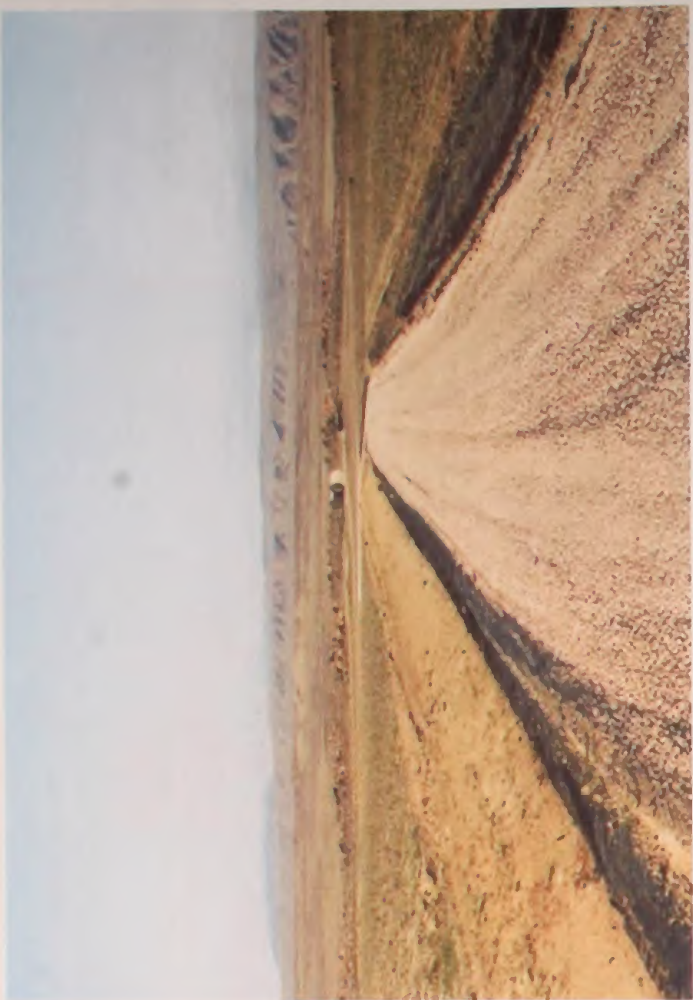






Seminole Road Gas Development Project EIS  
**FIGURE 6**  
 PROJECTED BUILD-OUT SCENARIO (MEDICINE BOW AND FOX HILLS FORMATION)





EXISTING 14-FOOT GRAVELED SURFACE ROAD AT PILOT PROJECT.  
NOTE PILOT PROJECT AERATION TANKS IN MIDDLE FOREGROUND.  
BORROW DITCHES VERY EVIDENT IN THIS PHOTO.



EXISTING ROAD AT PILOT PROJECT.  
THIS ROAD ACCESSES WATER TREATMENT FILTRATION TANKS.  
THERE IS 14-FOOT GRAVELED SURFACE.



# TYPICAL ROAD CROSS SECTION



SPEED DESIGN: 15 TO 30 MPH

NOTE:  
UPGRADED OR NEWLY CONSTRUCTED ROADS WOULD  
MEET STANDARDS OUTLINED IN BLM 9113 MANUAL.  
ROADS WOULD BE DESIGNED FOR ALL-WEATHER TRAVEL,  
WITH TURNOUTS AS NECESSARY.



EXISTING 14-FOOT GRAVELED SURFACE RESOURCE ROAD AT PILOT PROJECT.  
BORROW DITCHES ON EITHER SIDE OF ROADWAY; NOTE REVEGETATION ON  
BOTH SIDES OF ROAD.

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FIGURE 7

TYPICAL ACCESS ROAD





TYPICAL "DEEP-HOLE" DRILL RIG TO BE USED FOR DRILLING INTO THE MESAVERDE FORMATION. DEPTHS WILL VARY FROM A FEW THOUSAND FEET TO OVER 10,000 FEET. TRUCK-MOUNTED RIGS MAY BE USED FOR THE SHALLOWER MEDICINE BOX/FOX HILL COALS.

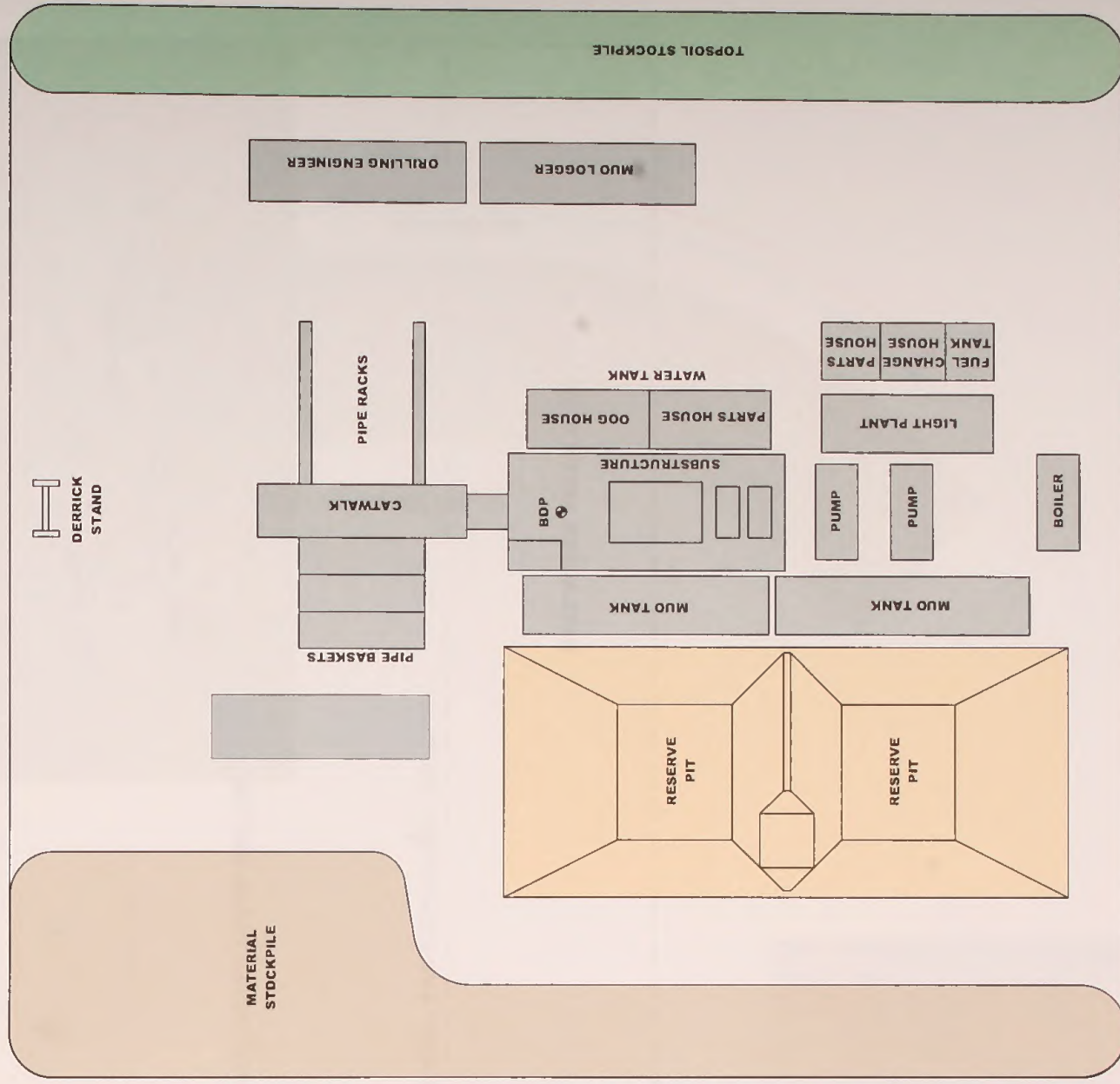


TYPICAL RESOURCE ROAD WITH 14-FOOT GRAVELED SURFACE TO BE USED TO ACCESS WELL PAD SITE (PRIOR TO RECLAMATION)





TYPICAL "DEEP-HOLE" DRILL RIG AT APPROXIMATELY 1/2 MILE FROM VIEWER.



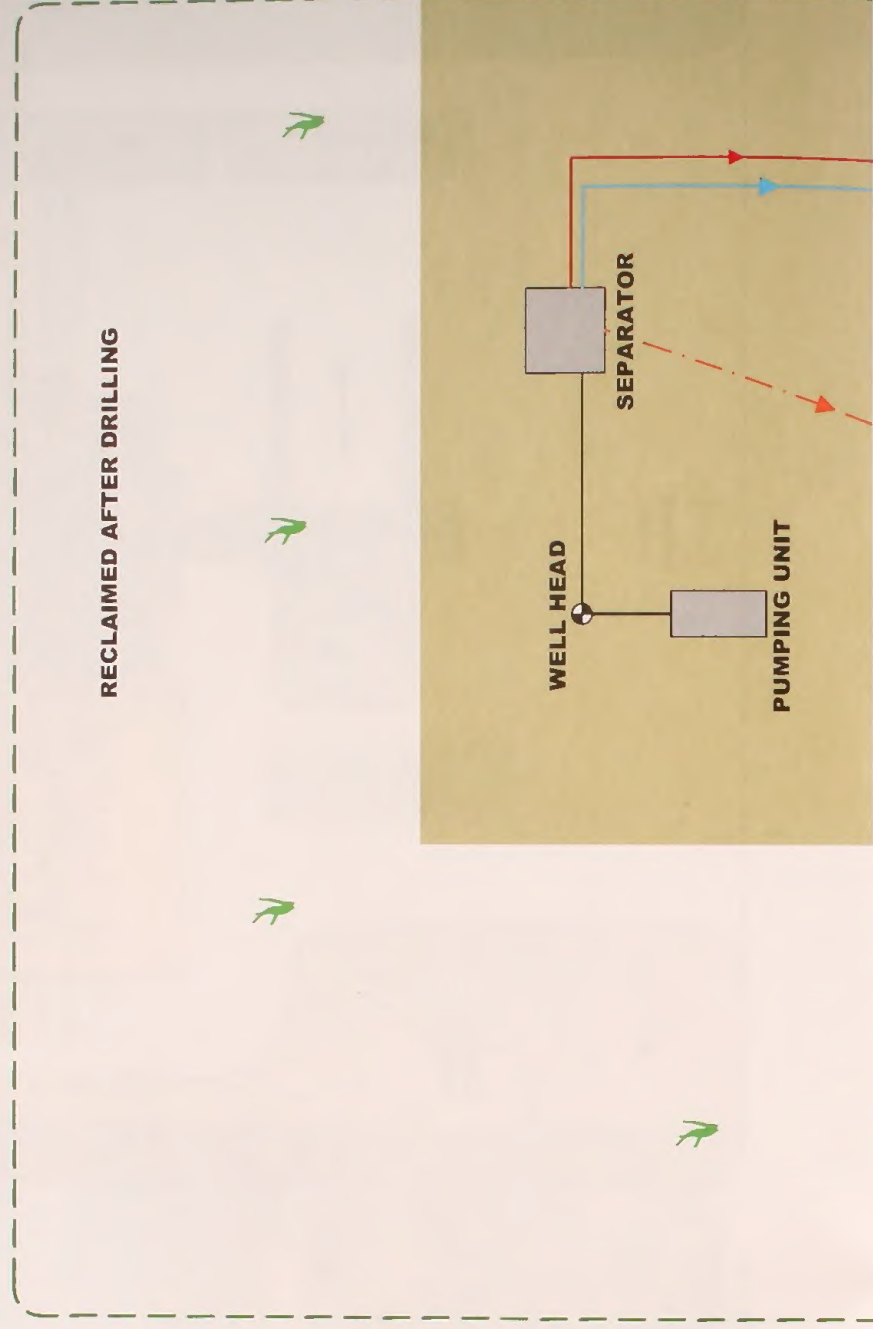
2.2 ACRE SURFACE DISTURBANCE / WELL PAD

Seminole Road Gas Development Project EIS  
FIGURE 8  
TYPICAL WELL PAD LAYOUT DURING DRILLING ACTIVITIES

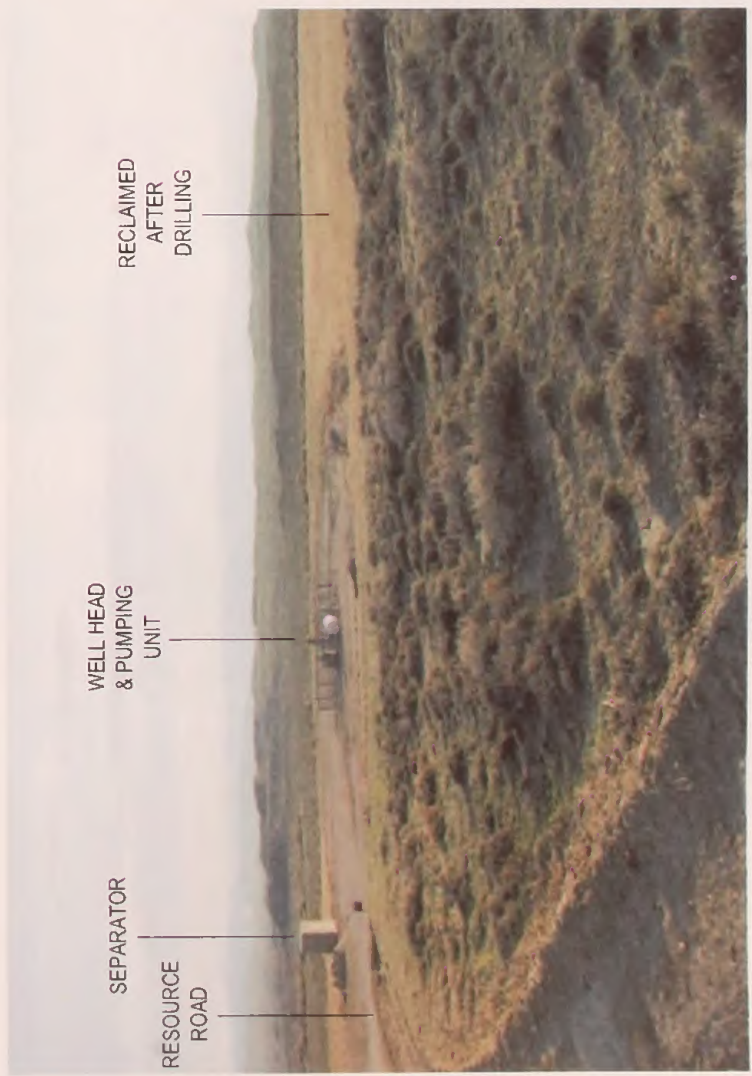
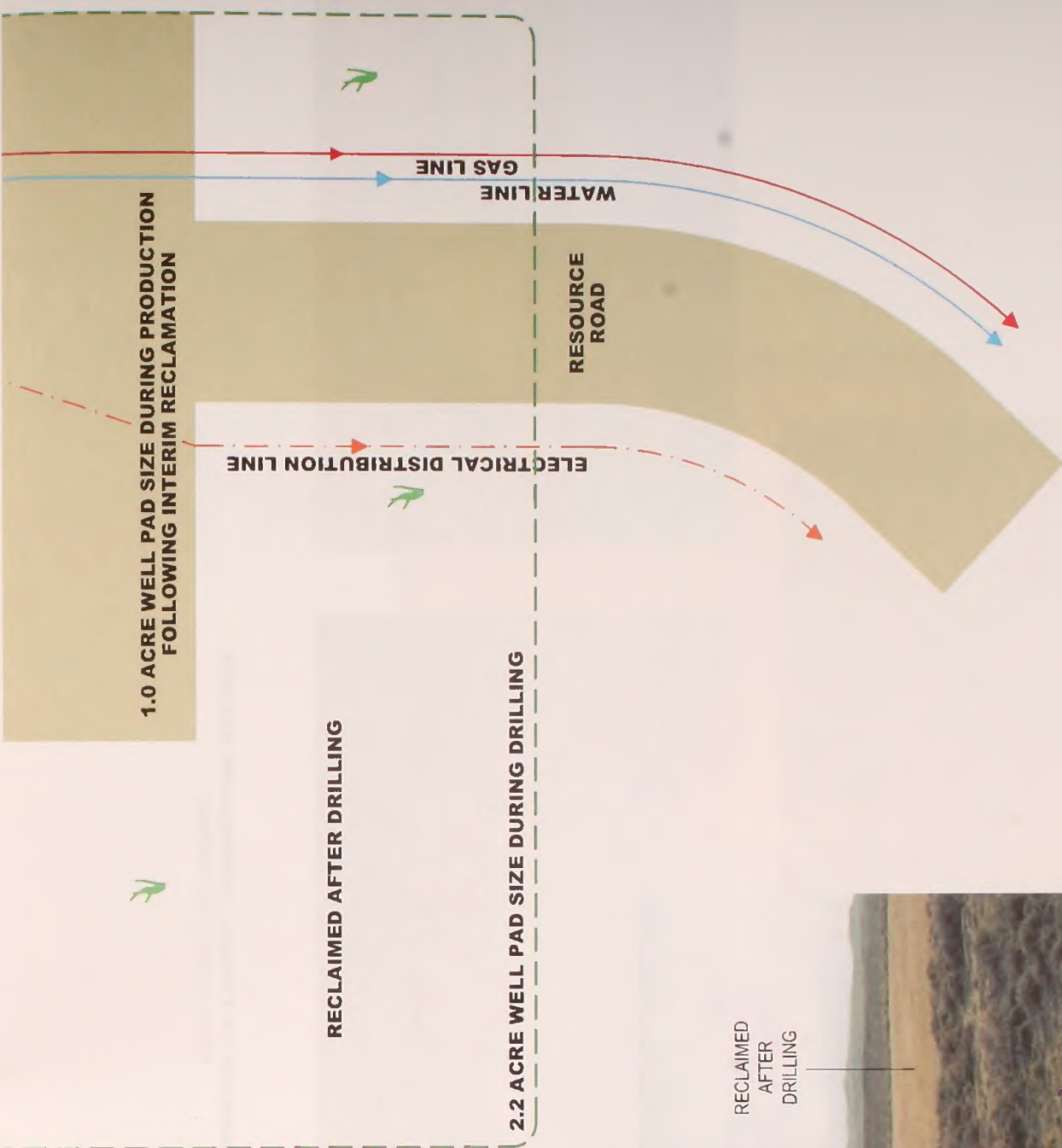




EXISTING WELL HEAD AND PUMPING UNIT AT PILOT PROJECT, SURROUNDED BY LIVESTOCK FENCING. WHITE TANK IS PROPANE TANK. PROPANE USED IN "MOTOR"-- GREEN COLORED ENGINE LOCATED TO LEFT OF WELL HEAD. DURING PILOT PROJECT, PUMPING UNITS POWERED BY PROPANE. ELECTRIC POWER WOULD BE USED IN BUILD-OUT, SO PROPANE TANK AND PROPANE MOTOR WOULD BE REMOVED.







TYPICAL PRODUCING WELL PAD SITE. WELL HEAD, PROPANE TANK AND MOTOR IN CENTER. WATER/GAS SEPARATOR BUILDING ON LEFT. NOTE RECLAMATION ON WELL PAD, MAINLY ON THE RIGHT. RESOURCE ROAD ACCESSES SITE ON LEFT SIDE OF PHOTO.

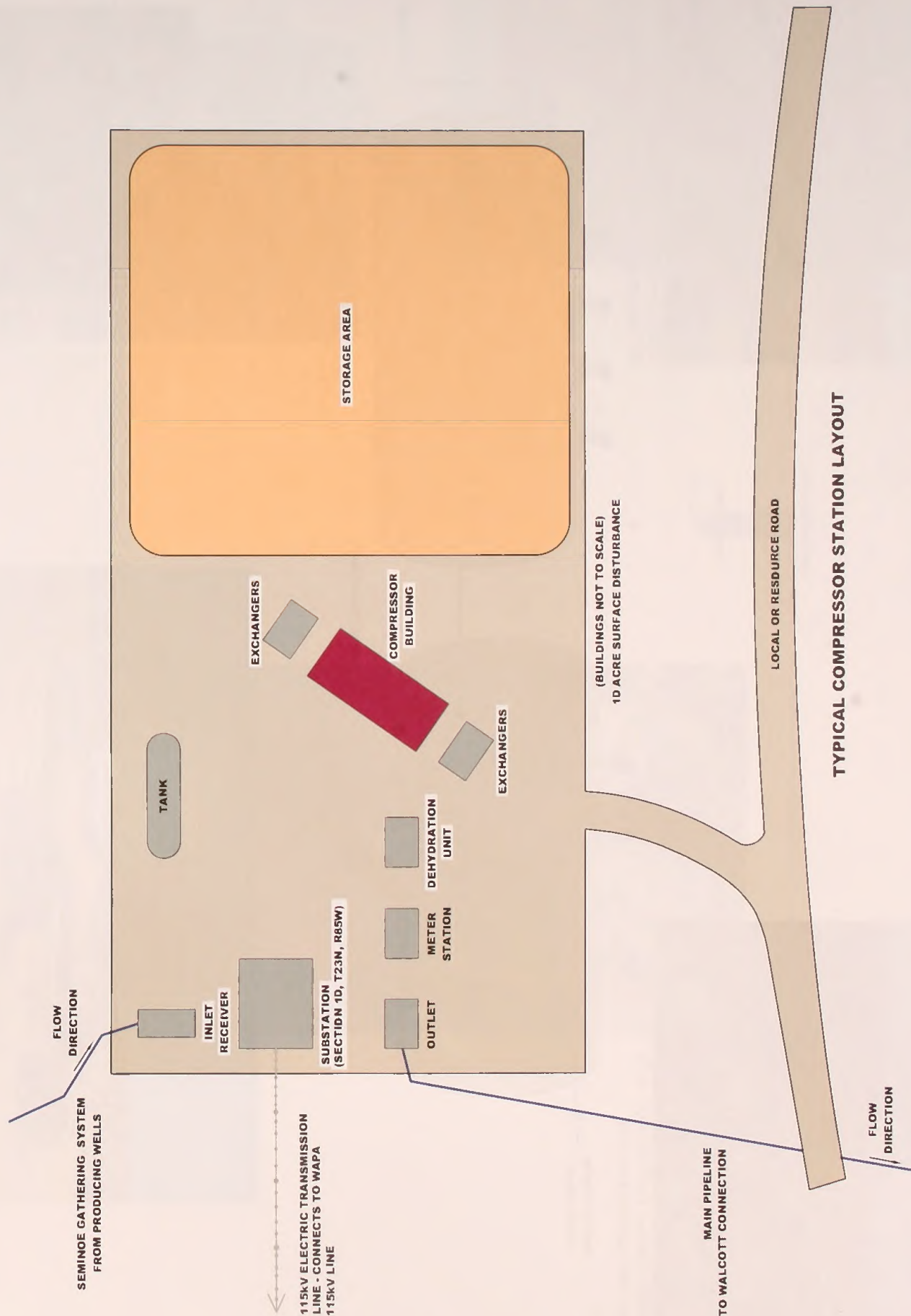
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 FIGURE 9  
 TYPICAL PRODUCING WELL LAYOUT





PHOTOGRAPHS OF TYPICAL COMPRESSOR STATION  
FACILITIES IN WYOMING





**TYPICAL COMPRESSOR STATION LAYOUT**

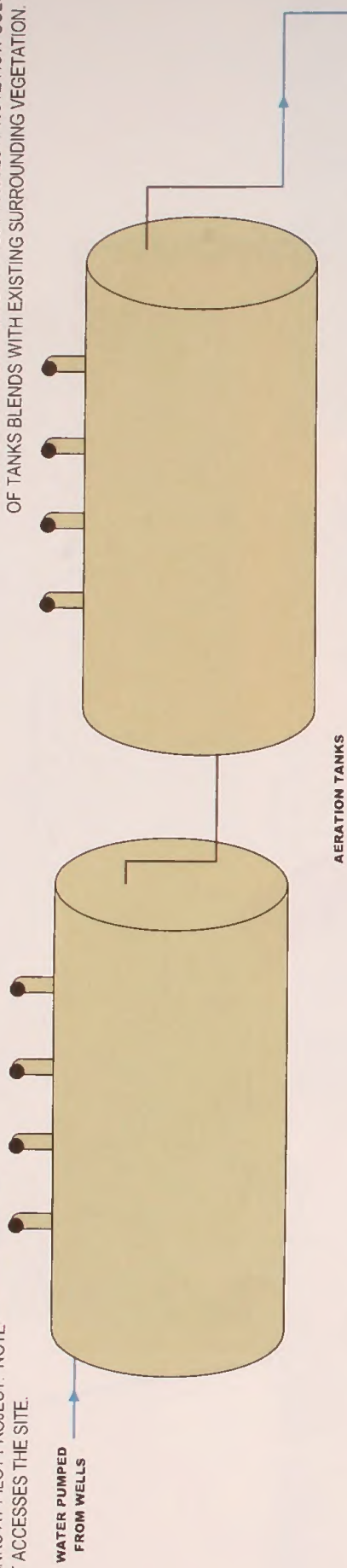




EXISTING AERATION TANKS AT PILOT PROJECT. NOTE RESOURCE ROAD THAT ACCESSES THE SITE.



EXISTING AERATION TANKS AT PILOT PROJECT. NOTE HOW COLOR OF TANKS BLENDS WITH EXISTING SURROUNDING VEGETATION.

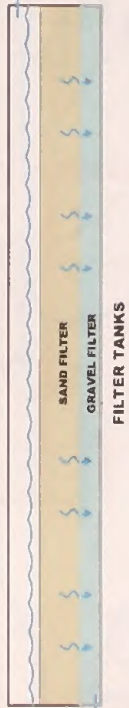


EXISTING FILTER TANKS (IN MIDDLE) WITH AERATION TANKS BEHIND.



EXISTING FILTER TANKS (IN MIDDLE) WITH AERATION TANKS BEHIND.





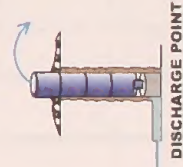
ACTUAL DISCHARGE POINT FROM PILOT PROJECT - LOCATED  
IN SECTION 26, T 24 N, R 85 W.



WATER INFLOW INTO FILTER TANKS.



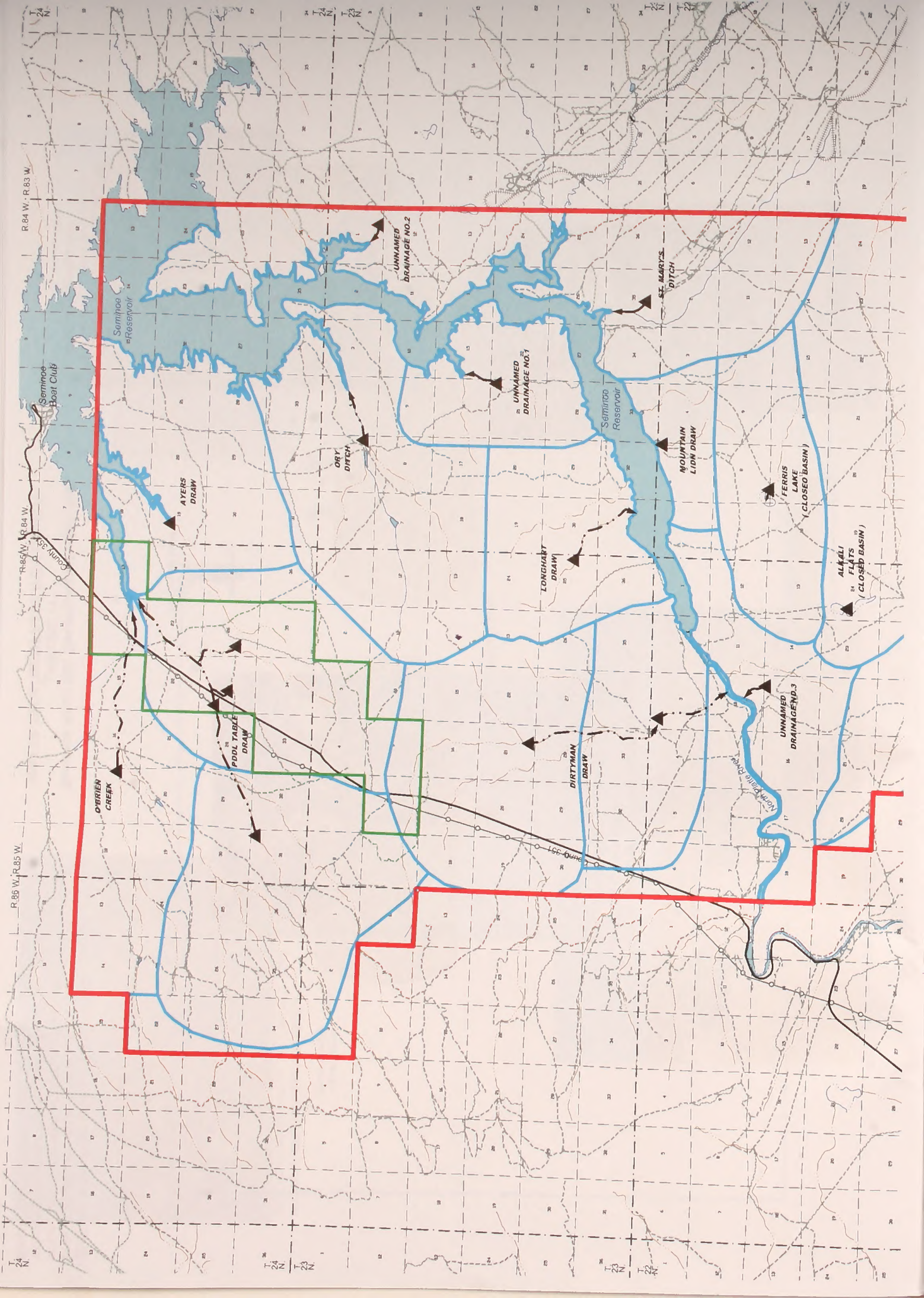
WATER FLOW IN POOL TABLE DRAW BELOW  
PILOT PROJECT DISCHARGE POINT.



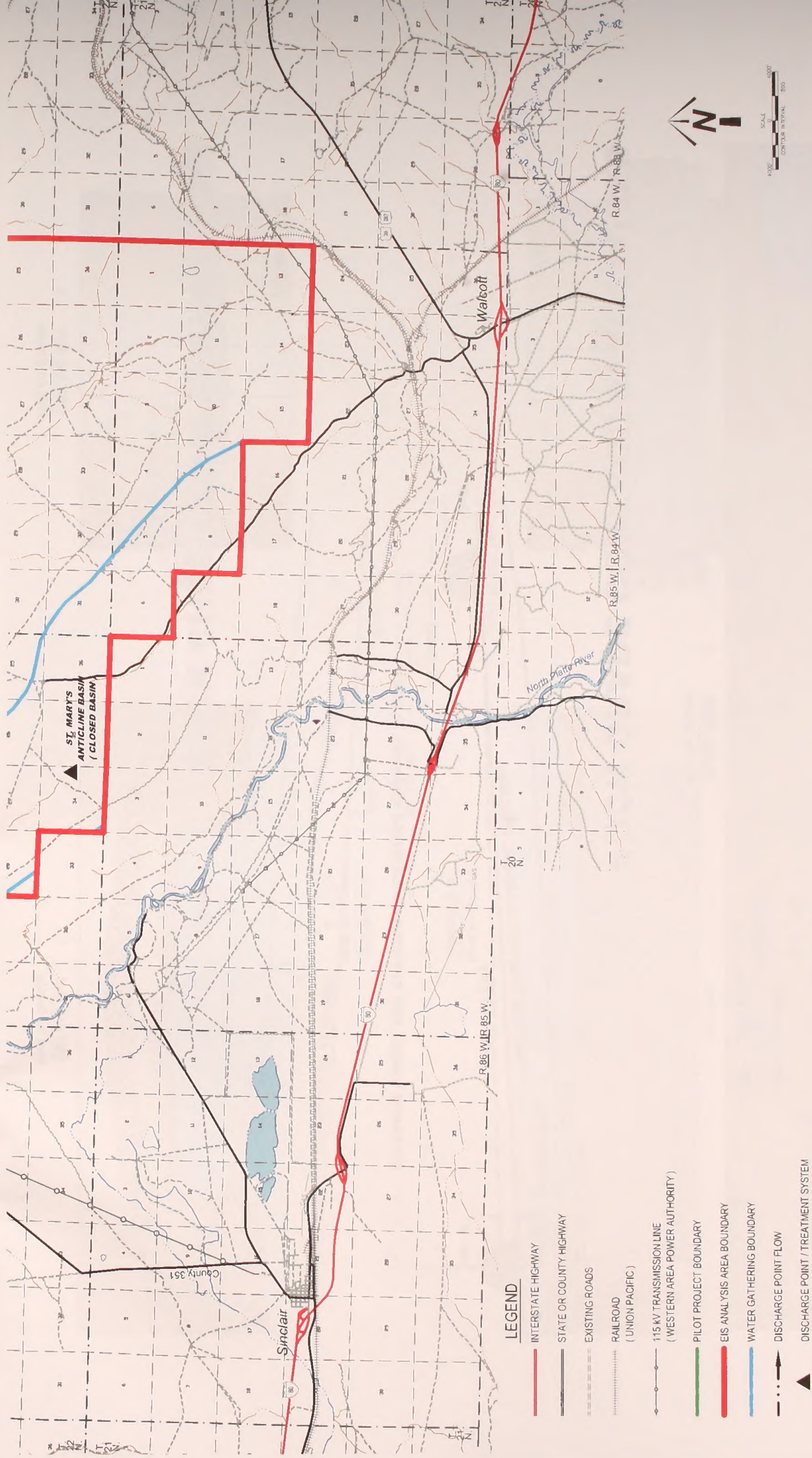
NOTE: THIS IS THE WATER TREATMENT SYSTEM UTILIZED  
AT PILOT PROJECT AND PROPOSED FOR ALTERNATIVE B.  
ACTUAL WATER TREATMENT METHODOLOGIES MAY VARY  
WITH ALTERNATIVE SELECTED AND WATER QUALITY  
ENCOUNTERED DURING BUILD-OUT.

Seminole Road Gas Development Project EIS  
FIGURE 11  
WATER TREATMENT FACILITIES LAYOUT



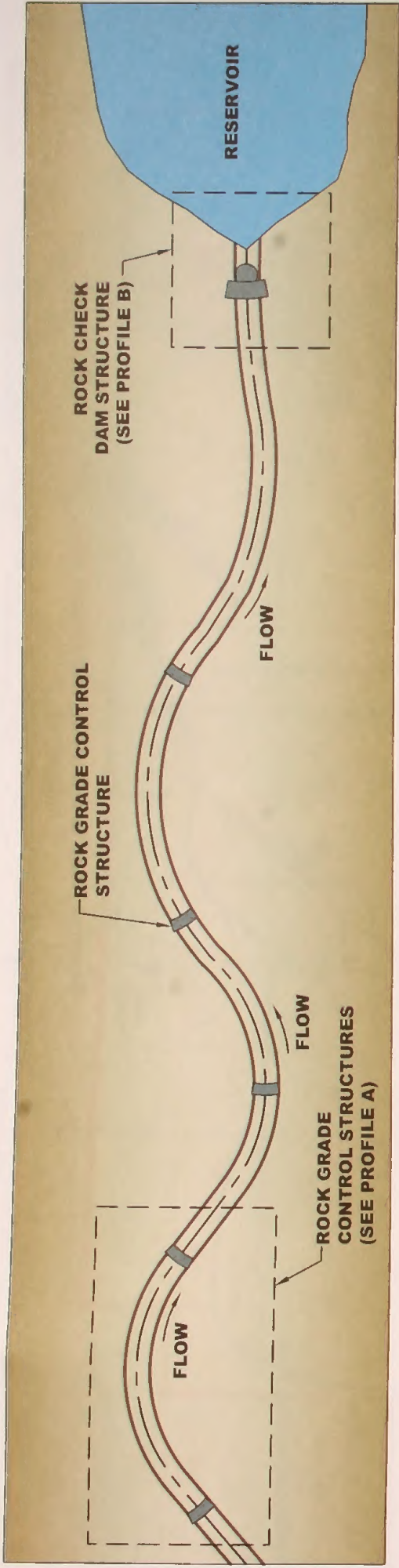






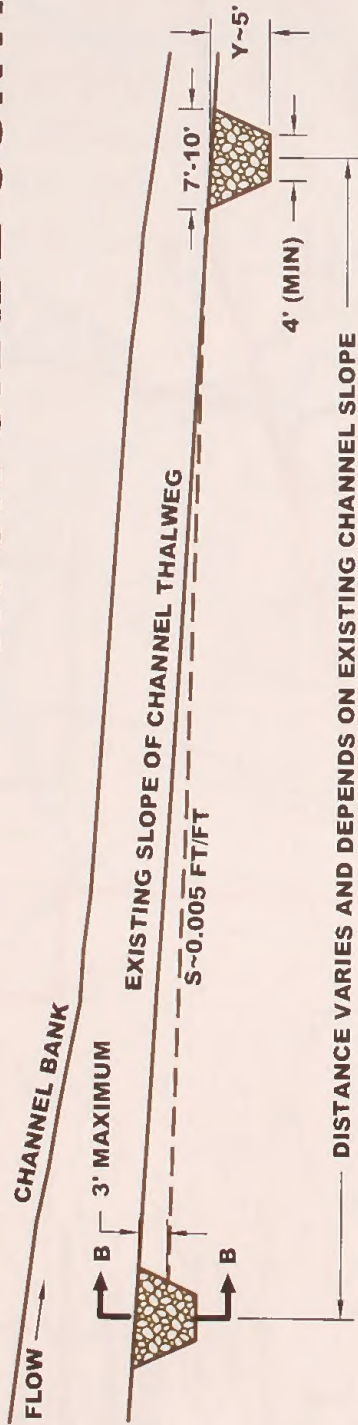
Seminole Road Gas Development Project EIS  
**FIGURE 12**  
**PRODUCED WATER DISCHARGE POINTS - ALTERNATIVE B**



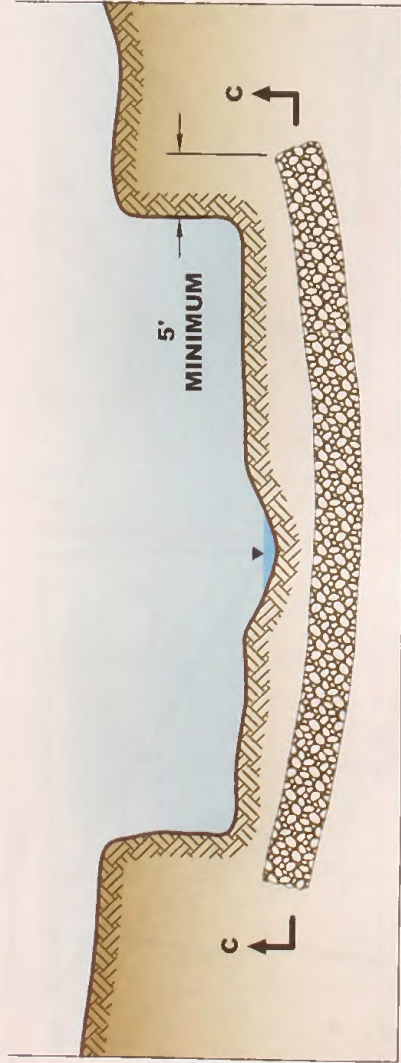


**PLAN VIEW**  
Not to Scale

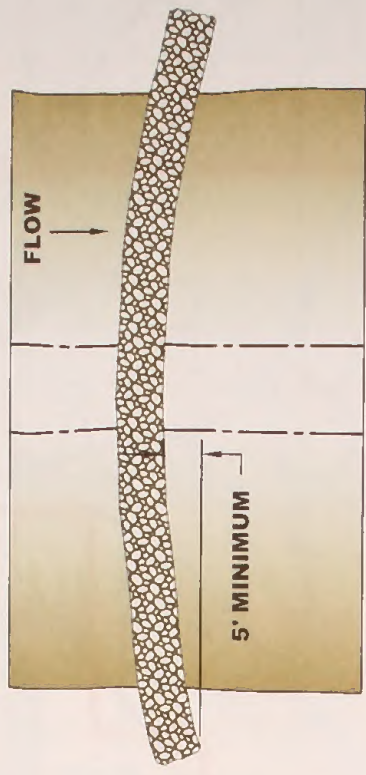
# ROCK GRADE CONTROL STRUCTURES



**PROFILE A**  
Not to Scale



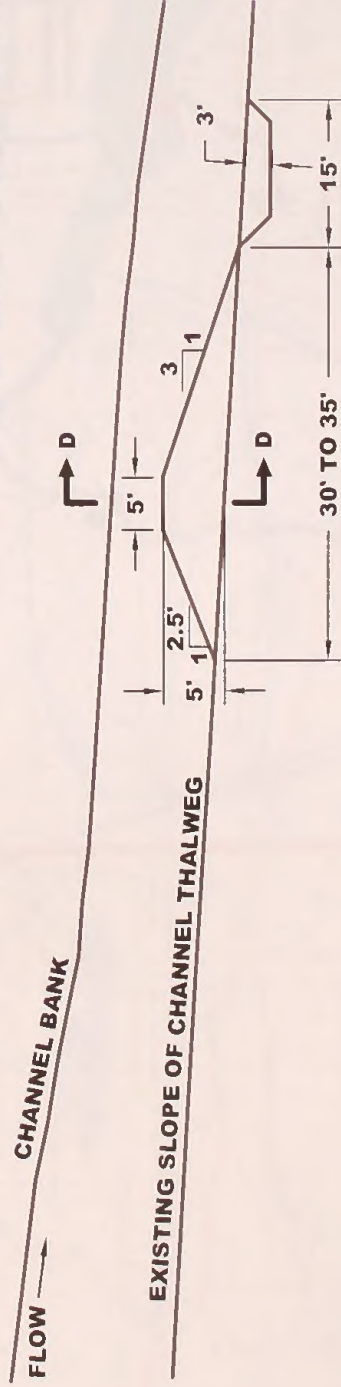
**DETAIL B-B**  
Not to Scale



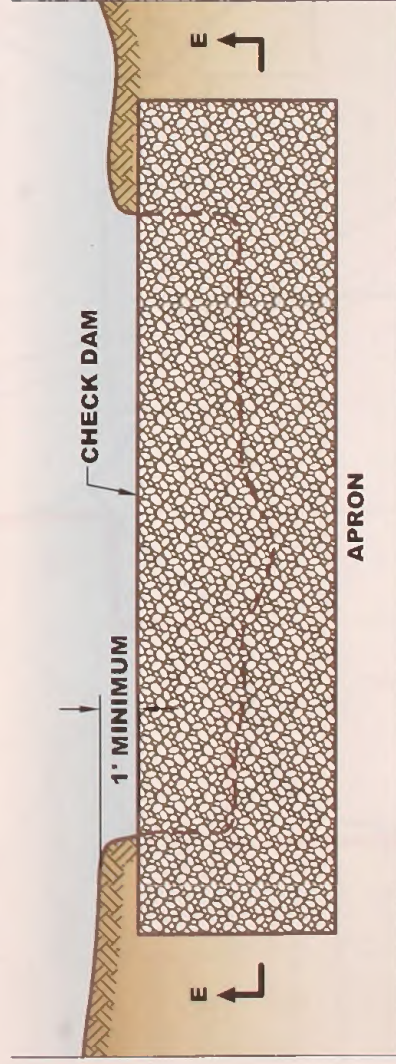
**DETAIL C-C**  
Not to Scale



# ROCK CHECK DAM STRUCTURES



**PROFILE B**  
Not to Scale

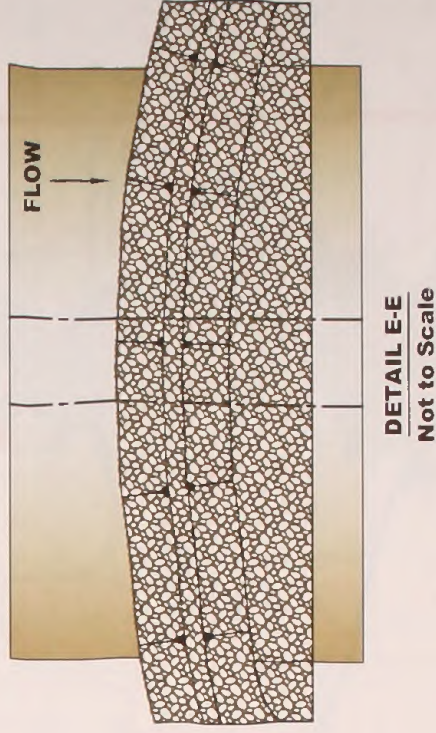


**DETAIL D-D**  
Not to Scale

## LEGEND:

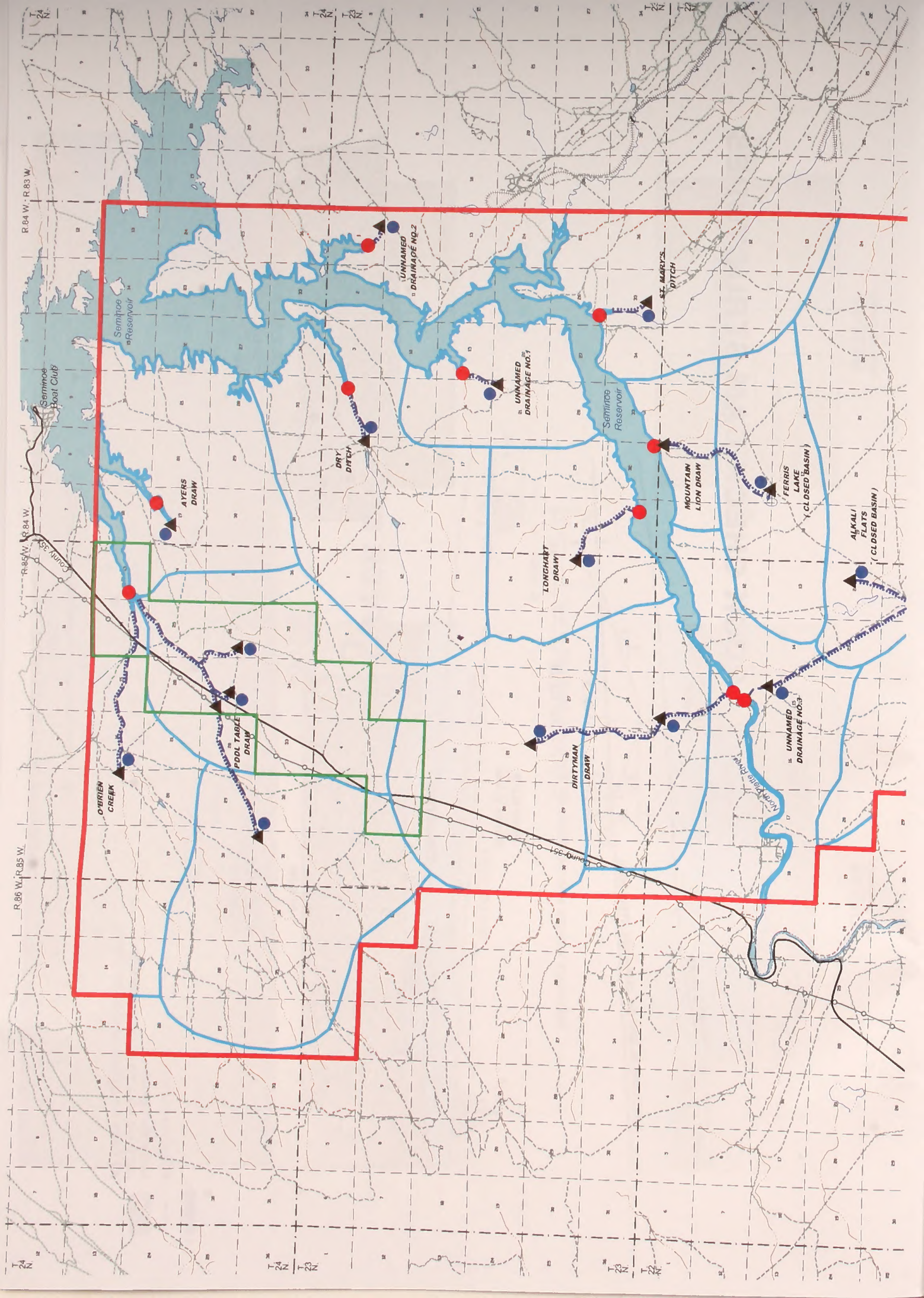
→ FLOW DIRECTION


 ROCK MATERIAL  
 (ACTUAL SIZE TO BE DETERMINED  
 AS PART OF DETAILED ENGINEERING)

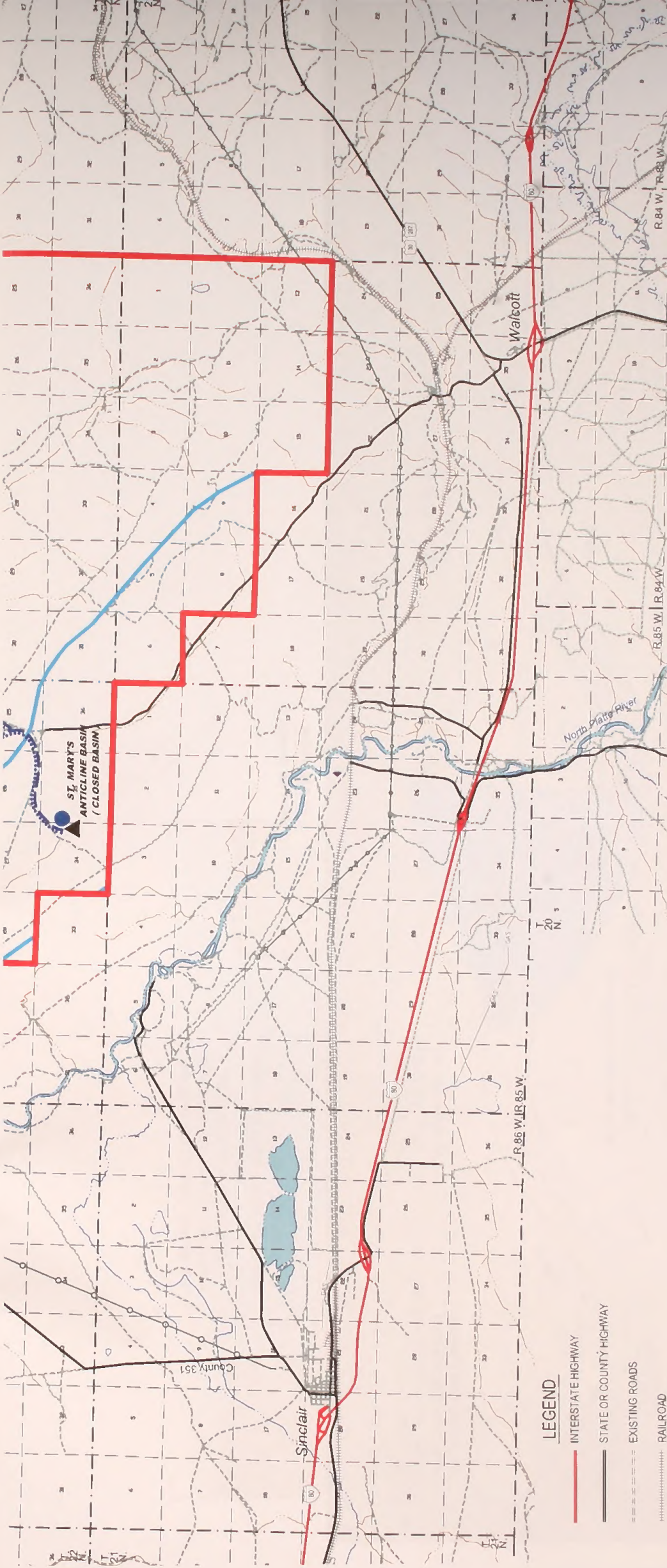


**DETAIL E-E**  
Not to Scale



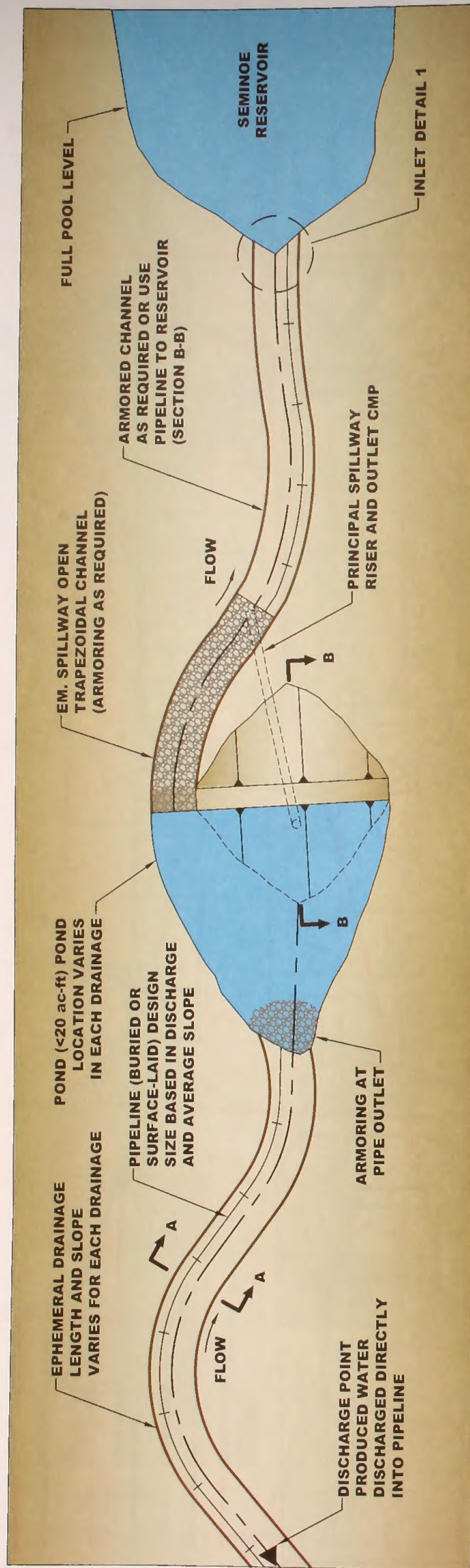






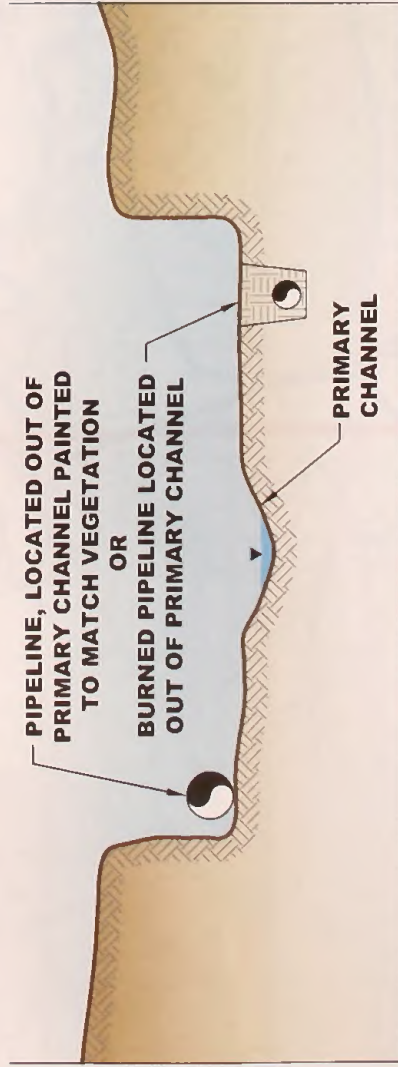
Seminoe Road Gas Development Project EIS  
FIGURE 14  
DIRECT DISCHARGE INTO SEMINOE RESERVOIR - ALTERNATIVE C



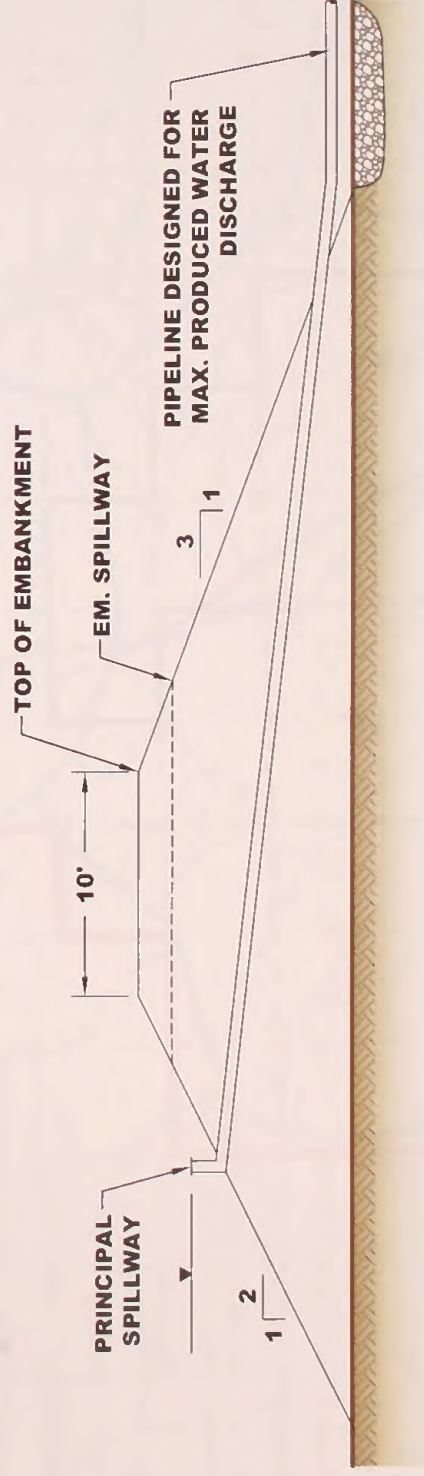


PLAN VIEW  
Not to Scale

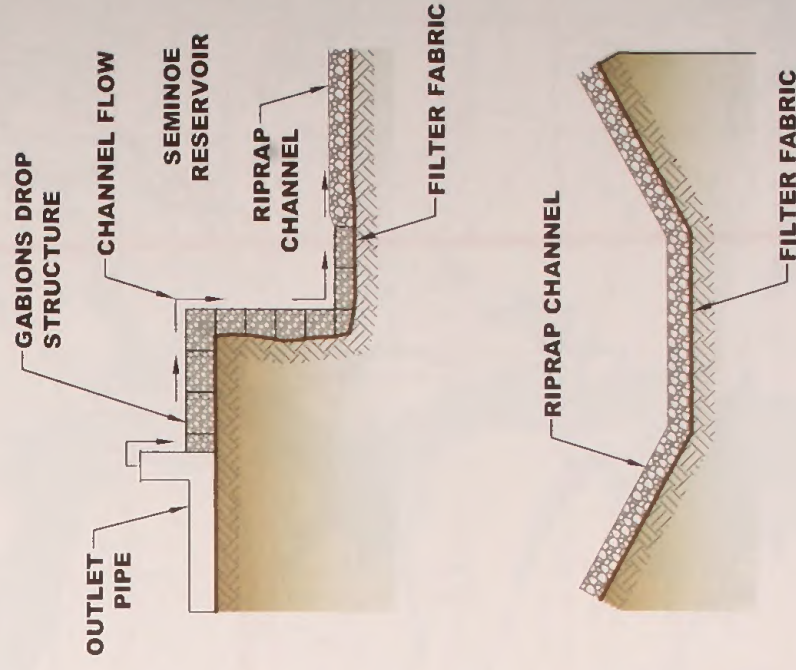




**SECTION A-A**  
Not to Scale

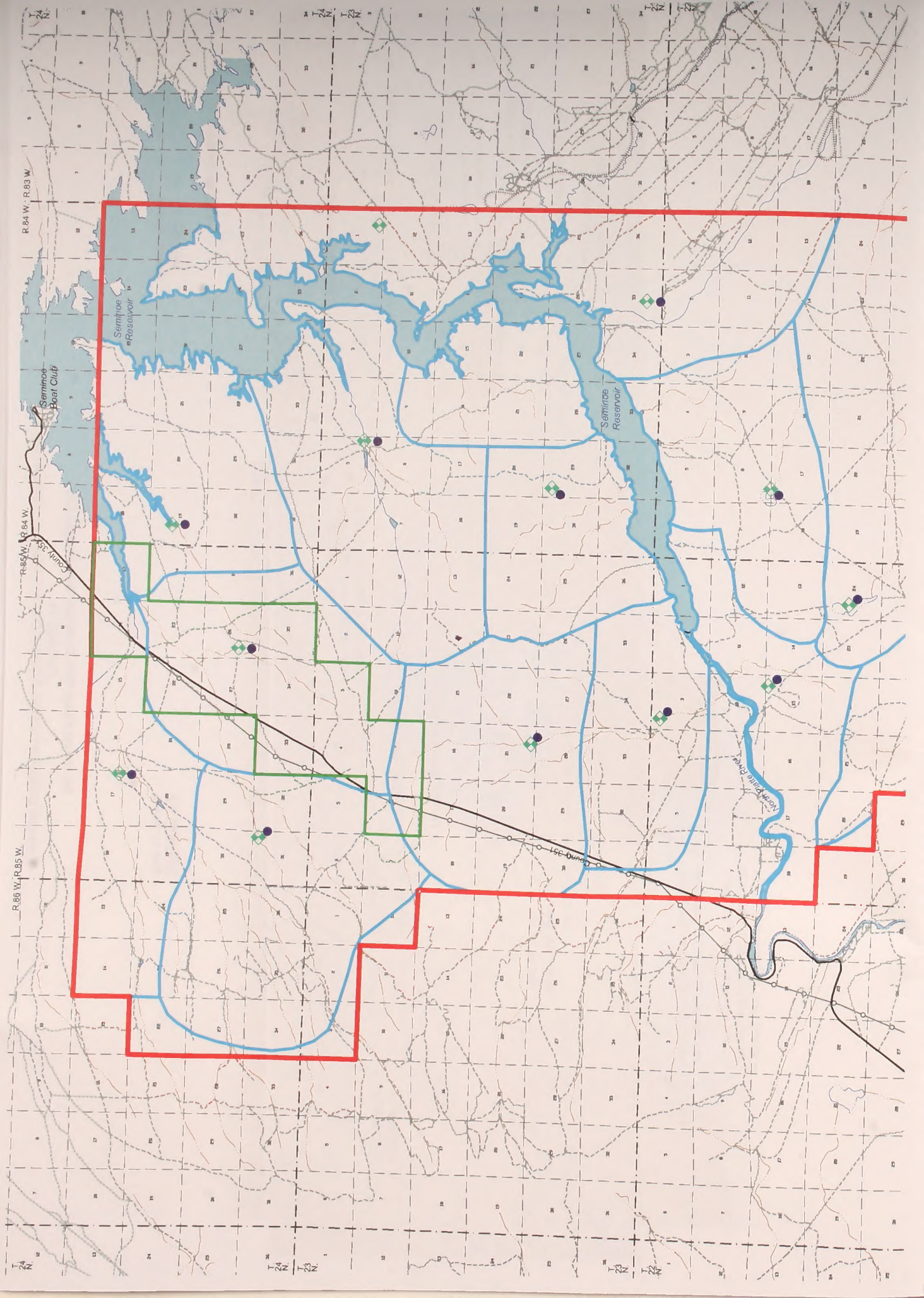


**SECTION B-B**  
Not to Scale

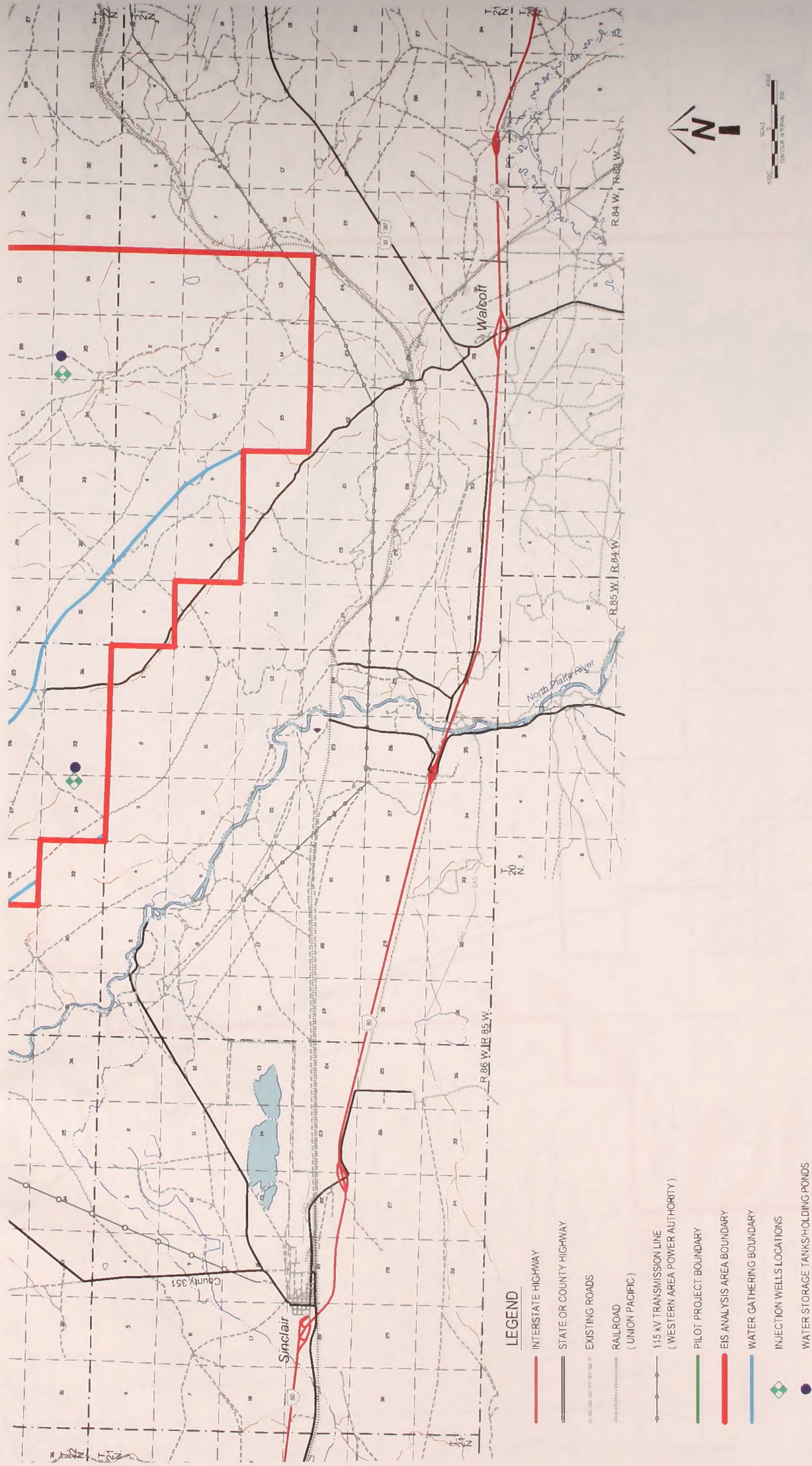


**DETAIL 1**  
Not to Scale



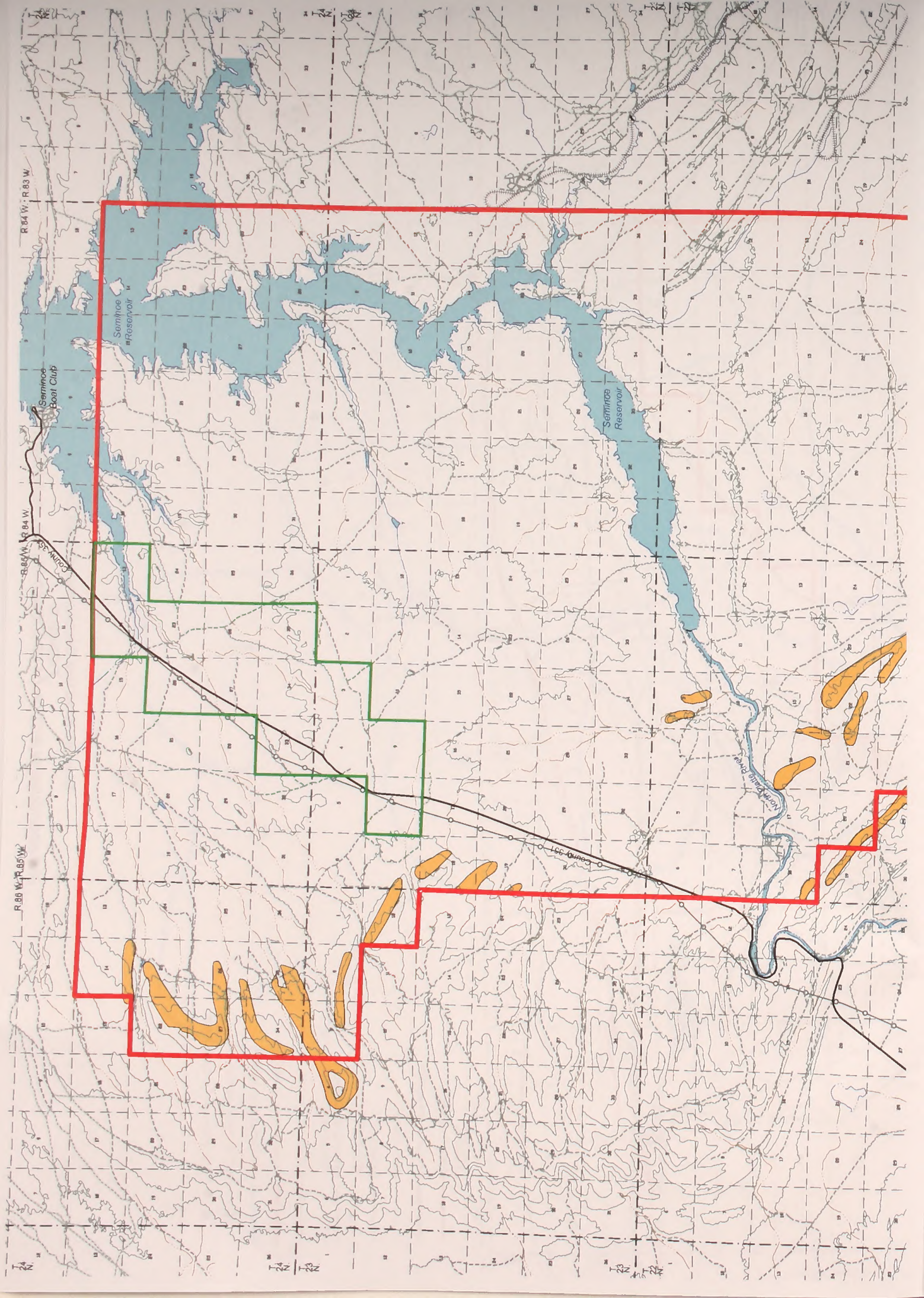






Seminoe Road Gas Development Project EIS  
 FIGURE 16  
 UNDERGROUND INJECTION OF PRODUCED WATER - ALTERNATIVE D

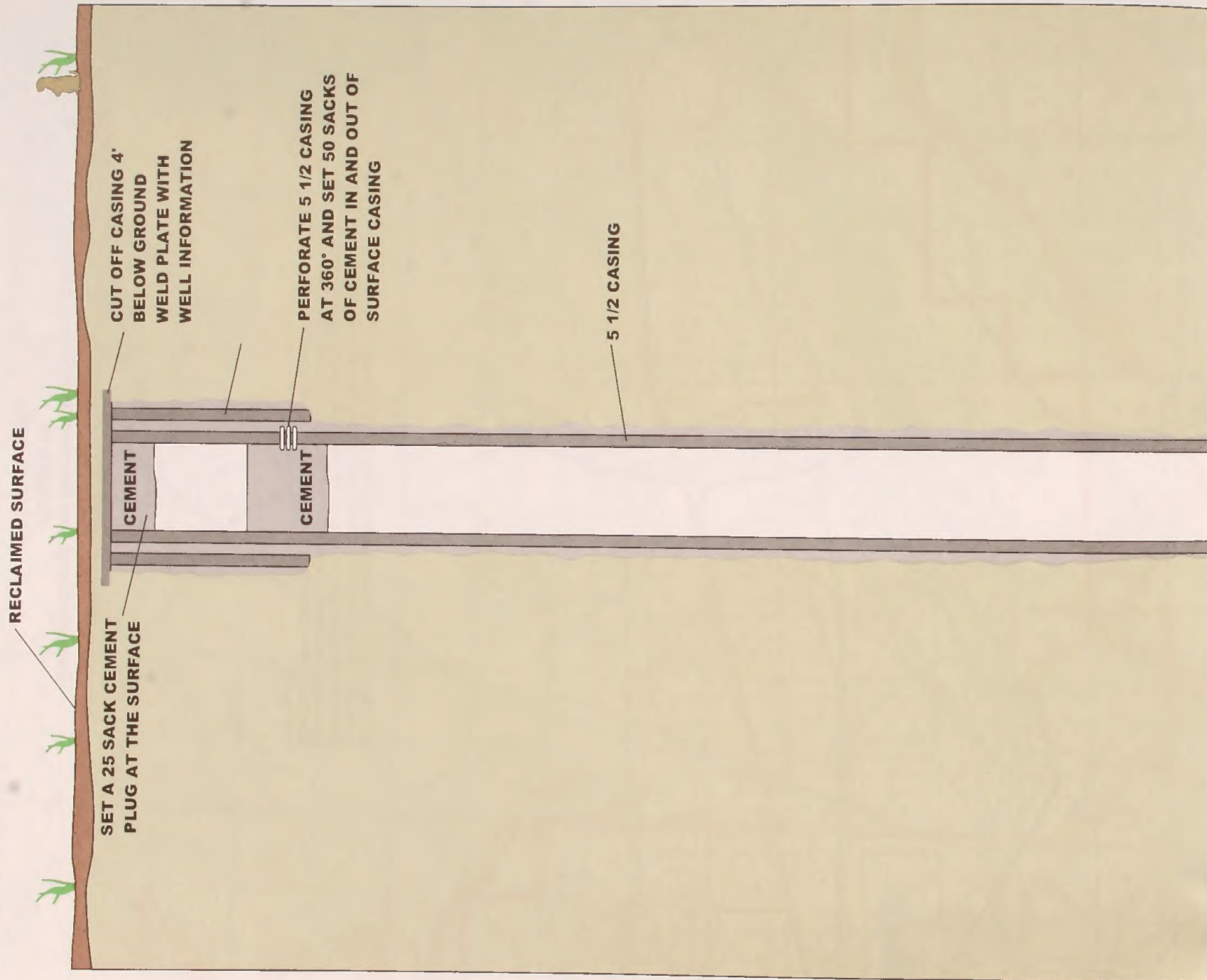




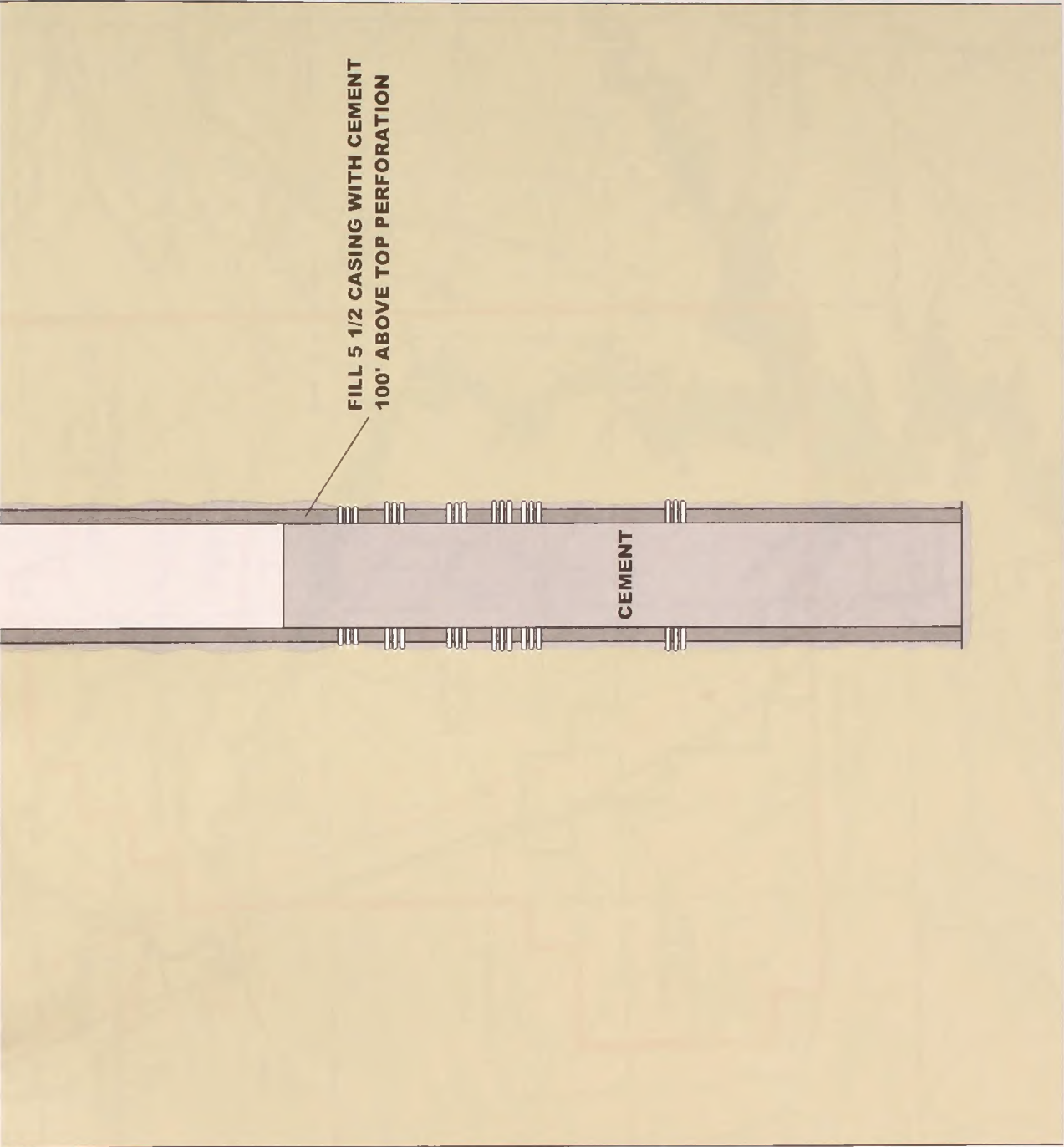






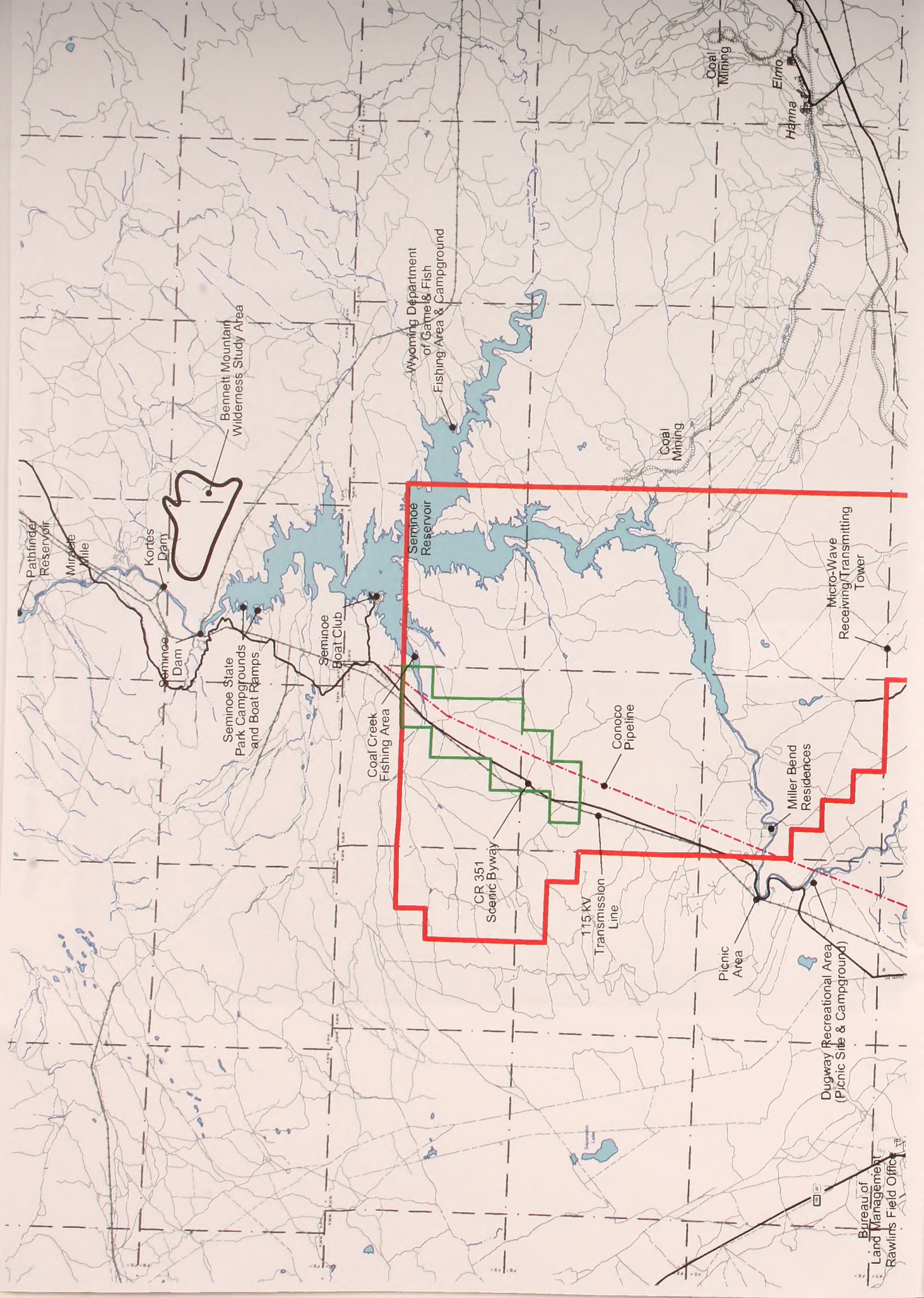






Seminole Road Gas Development Project EIS  
FIGURE 18  
CONCEPTUAL SCHEMATIC OF PLUGGED AND ABANDONED WELLBORE





Pathfinder Reservoir

Miracle Mile

Kortes Dam

Seminoe Dam

Seminoe State Park Campgrounds and Boat Ramps

Seminoe Boat Club

Coal Creek Fishing Area

Seminoe Reservoir

Wyoming Department of Game & Fish Fishing Area & Campground

CR 351 Scenic Byway

115 kV Transmission Line

Conoco Pipeline

Miller Bend Residences

Picnic Area

Dugway Recreational Area (Picnic Site & Campground)

Micro-Wave Receiving/Transmitting Tower

Coal Mining

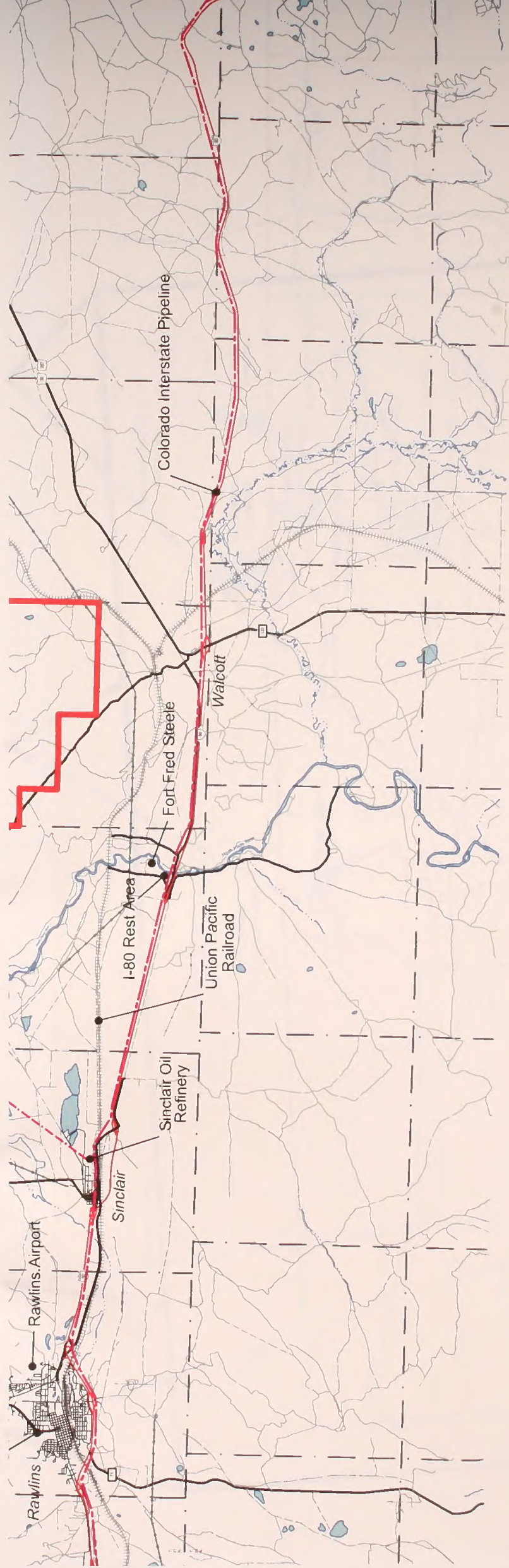
Elmo

Hanna

Coal Mining

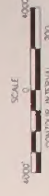
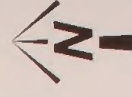
Bureau of Land Management Rawlins Field Office





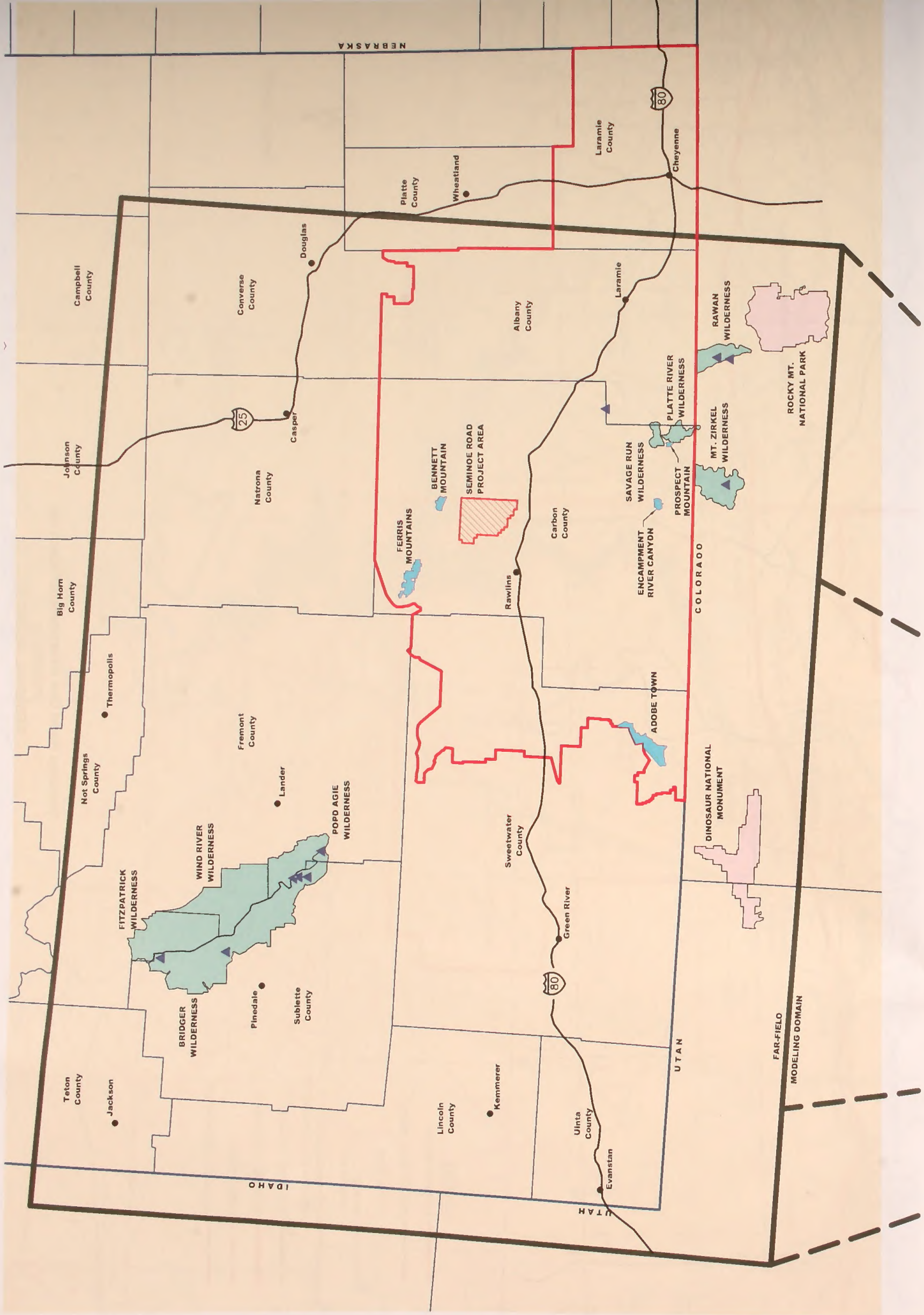
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- CONOCO PIPELINE
- COLORADO INTERSTATE PIPELINE

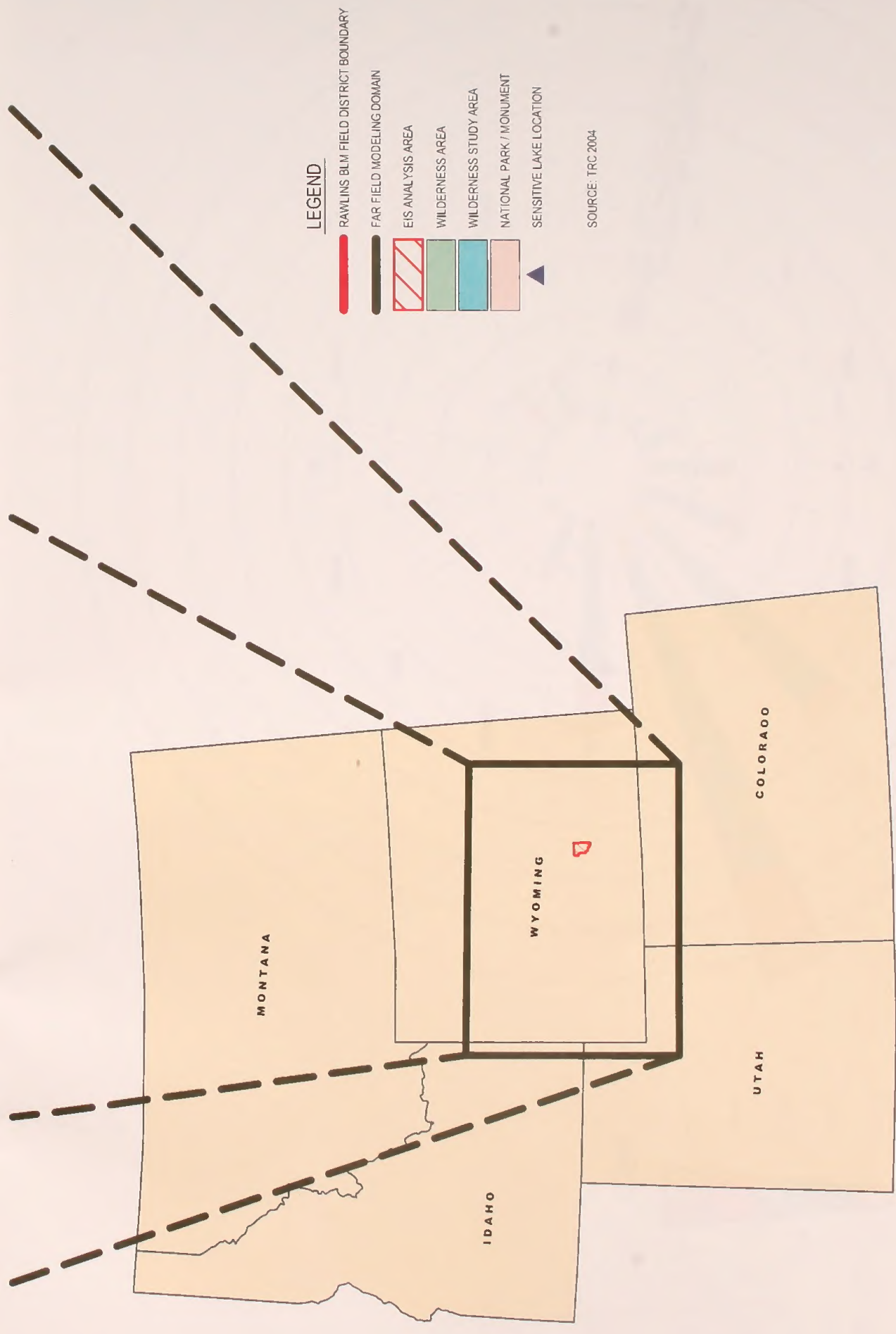


Seminoe Road Gas Development Project EIS  
**FIGURE 19**  
 REGIONAL ACTIVITY







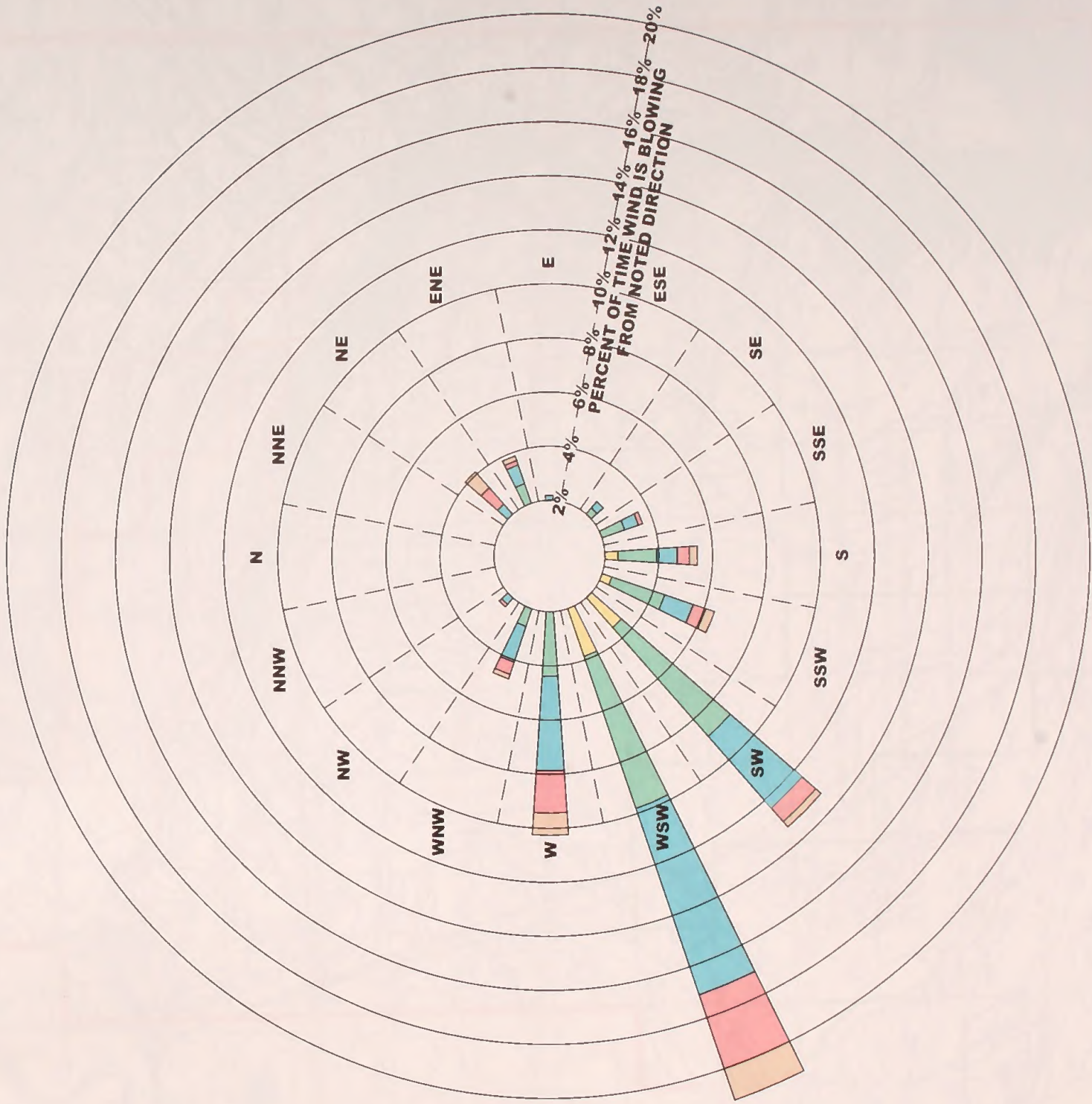


Seminoe Road Gas Development Project EIS  
FIGURE 20  
AIR QUALITY MODELING DOMAIN

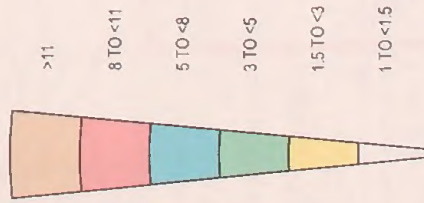








# LEGEND



WIND SPEED  
CATEGORIES (m/s)  
(SHOWN AS DIRECTION FROM  
WHICH WIND IS BLOWING)

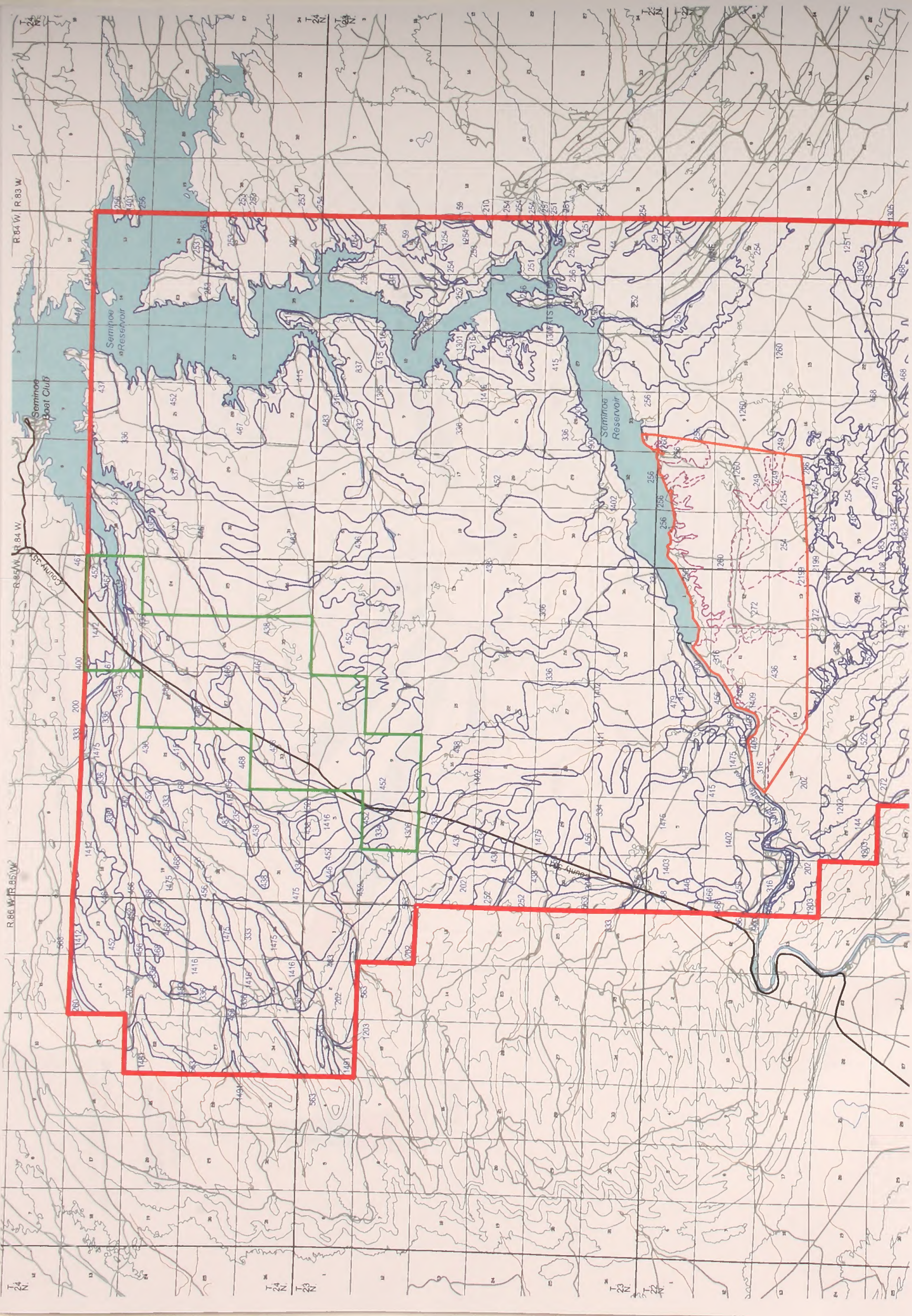
SOURCE: COMPLIANCE PARTNERS INC.  
OF FORT COLLINS, COLORADO

Seminole Road Gas Development Project EIS

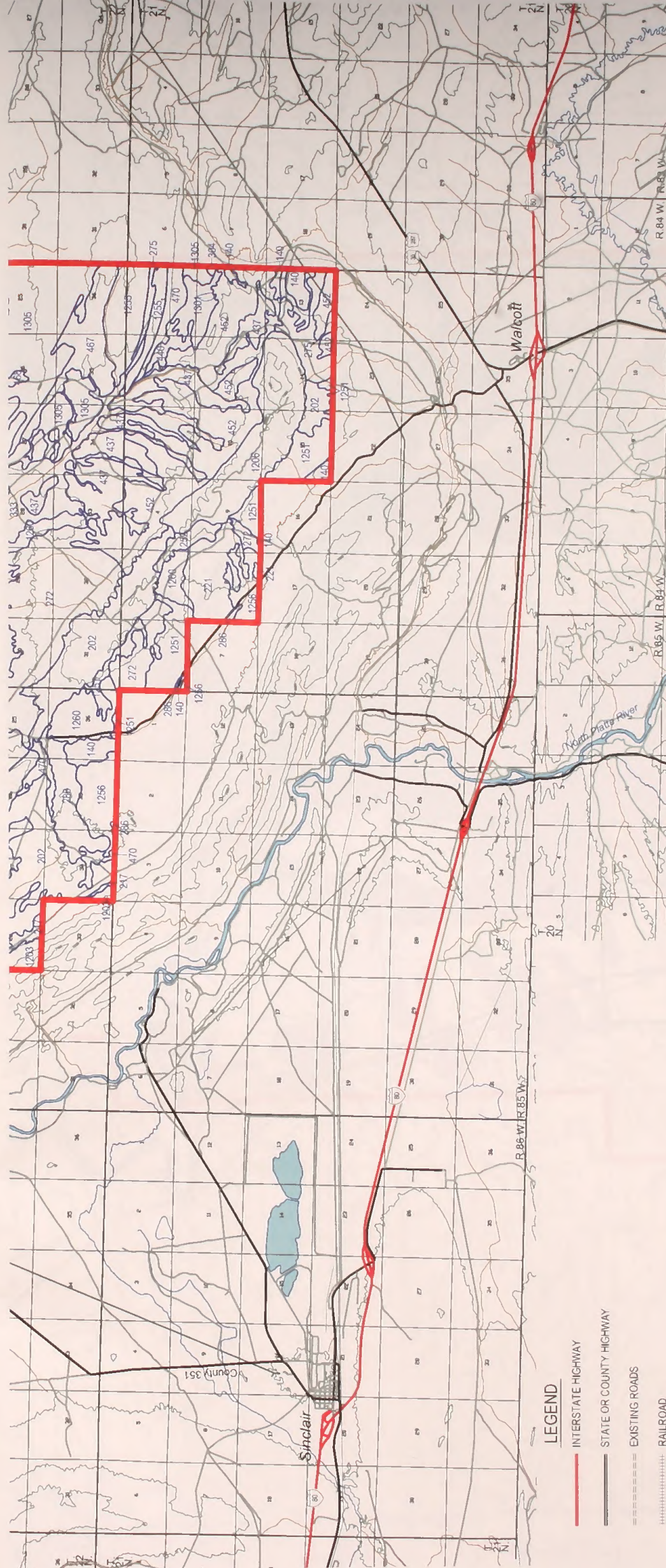
FIGURE 21

WIND ROSE - RAWLINS, WYOMING



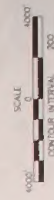
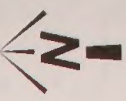






**LEGEND**

- INTERSTATE HIGHWAY
- STATE OR COUNTY HIGHWAY
- EXISTING ROADS
- RAILROAD (UNION PACIFIC)
- 115 KV TRANSMISSION LINE (WESTERN AREA POWER AUTHORITY)
- PILOT PROJECT BOUNDARY
- EIS ANALYSIS AREA BOUNDARY
- SOIL TYPE BOUNDARY
- SOIL TYPE BOUNDARY INFERRED (SEE NOTE 4)
- SOIL TYPE ID
- OUT OF SURVEY AREA (OSA). THIS AREA HAS NOT BEEN SURVEYED FOR SOILS BY NATIONAL RESOURCE CONSERVATION SERVICE (NRCS) (FORMERLY KNOWN AS THE SOIL CONSERVATION SERVICE).

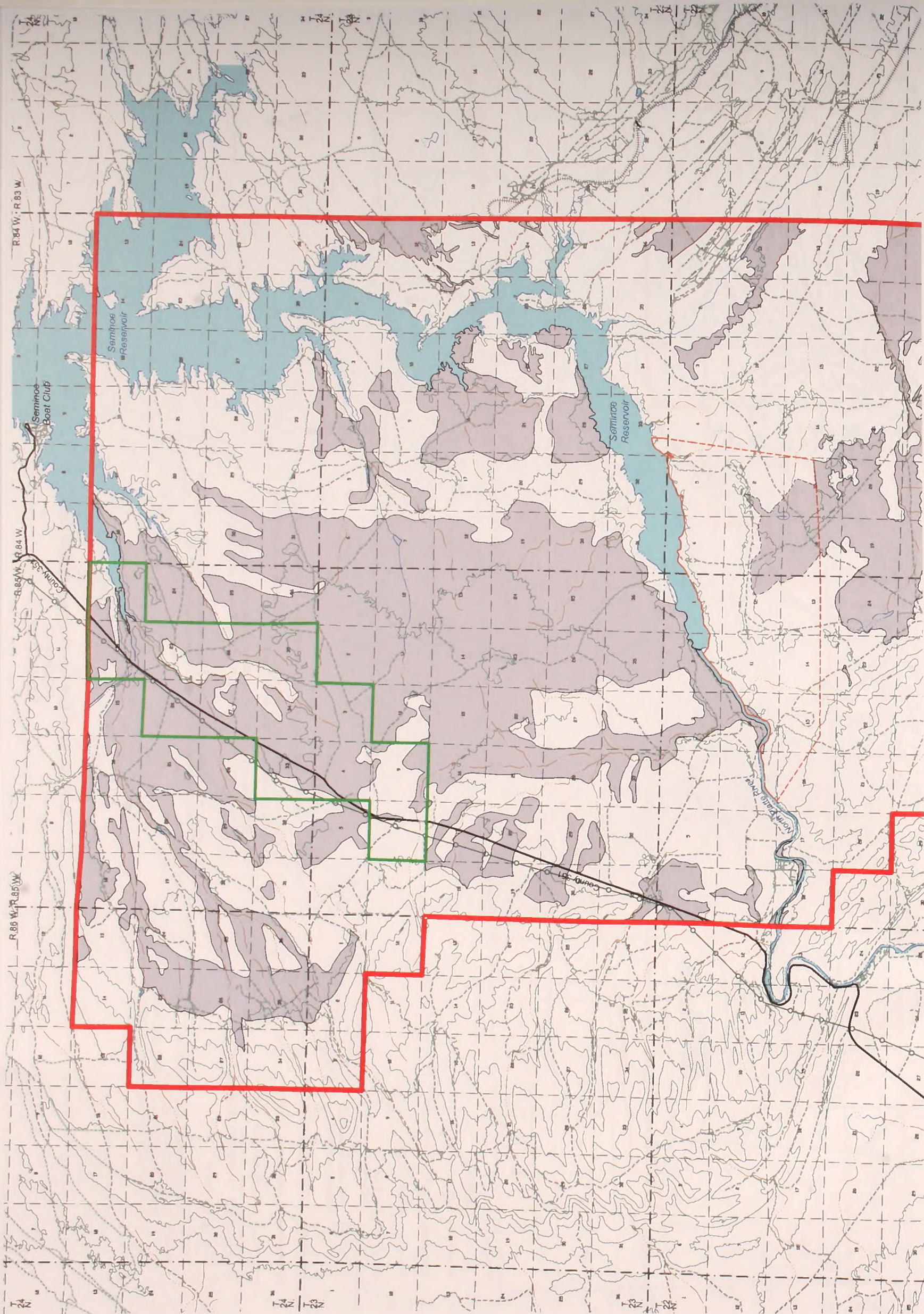


**NOTES:**

- 1 SOIL TYPE DESCRIPTIONS AVAILABLE FROM NATIONAL RESOURCE CONSERVATION SERVICE.
- 2 THE SOURCE OF SOIL MAPPING WAS THE NATIONAL RESOURCE CONSERVATION SERVICE AND BUREAU OF LAND MANAGEMENT, RAWLINS FIELD DISTRICT OFFICE.
- 3 INFORMATION TAKEN FROM SOIL MAP UNIT DESCRIPTIONS, SOIL PEDON DESCRIPTIONS, AND INTERPRETIVE DATA PROVIDED BY THE BUREAU OF LAND MANAGEMENT AND NATIONAL RESOURCE CONSERVATION SERVICE.
- 4 SOIL MAP UNIT BOUNDARIES SHOWN BY DASHED LINES ARE INTERPOLATED FROM SURROUNDING FIELD DELINEATIONS AND ARE TENTATIVE UNTIL FIELD MAPPING IS COMPLETED.

**Seminole Road Gas Development Project EIS**  
**FIGURE 22**  
**SOILS MAP**





R 84 W - R 83 W

R 85 W - R 84 W

R 86 W - R 85 W

Seminoe Reservoir

Seminole Boat Club

Seminoe Reservoir

North Star River

Contour 300

N

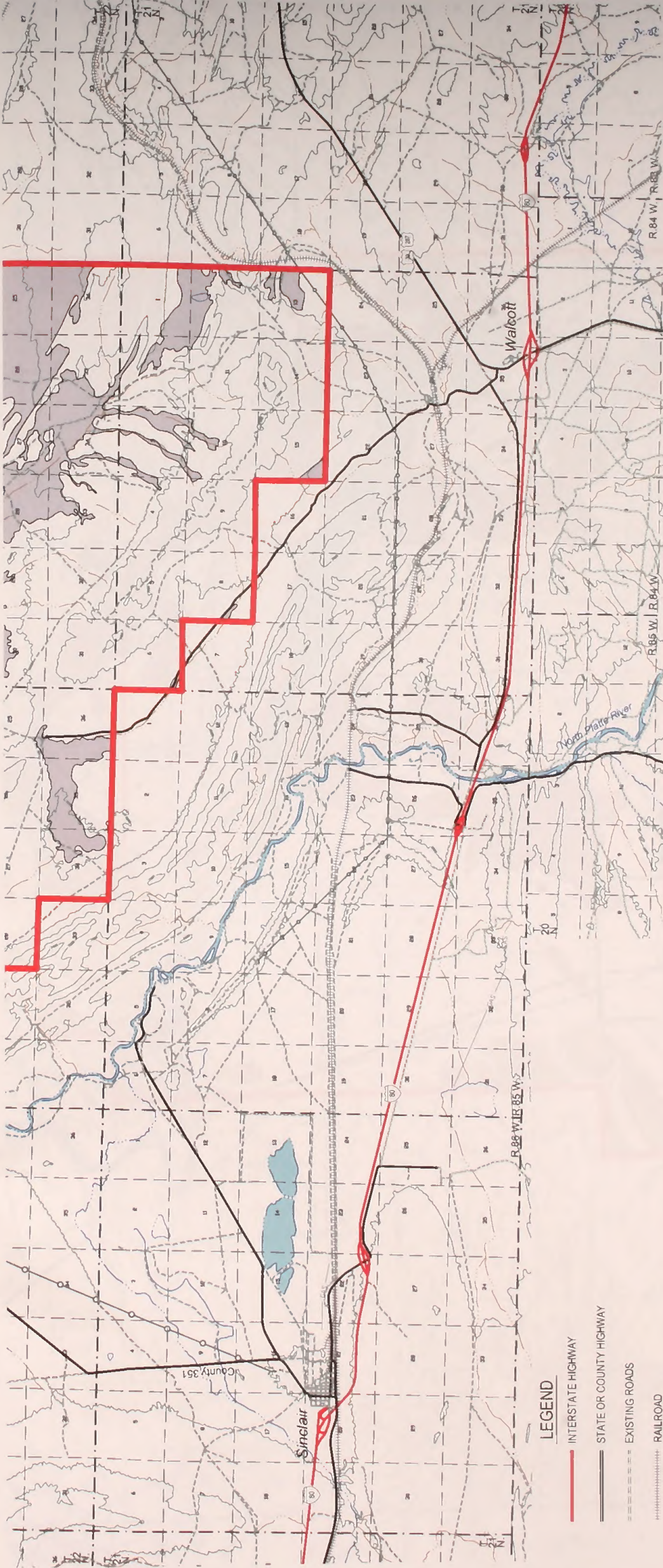
N

N

N

N



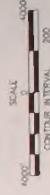


#### LEGEND

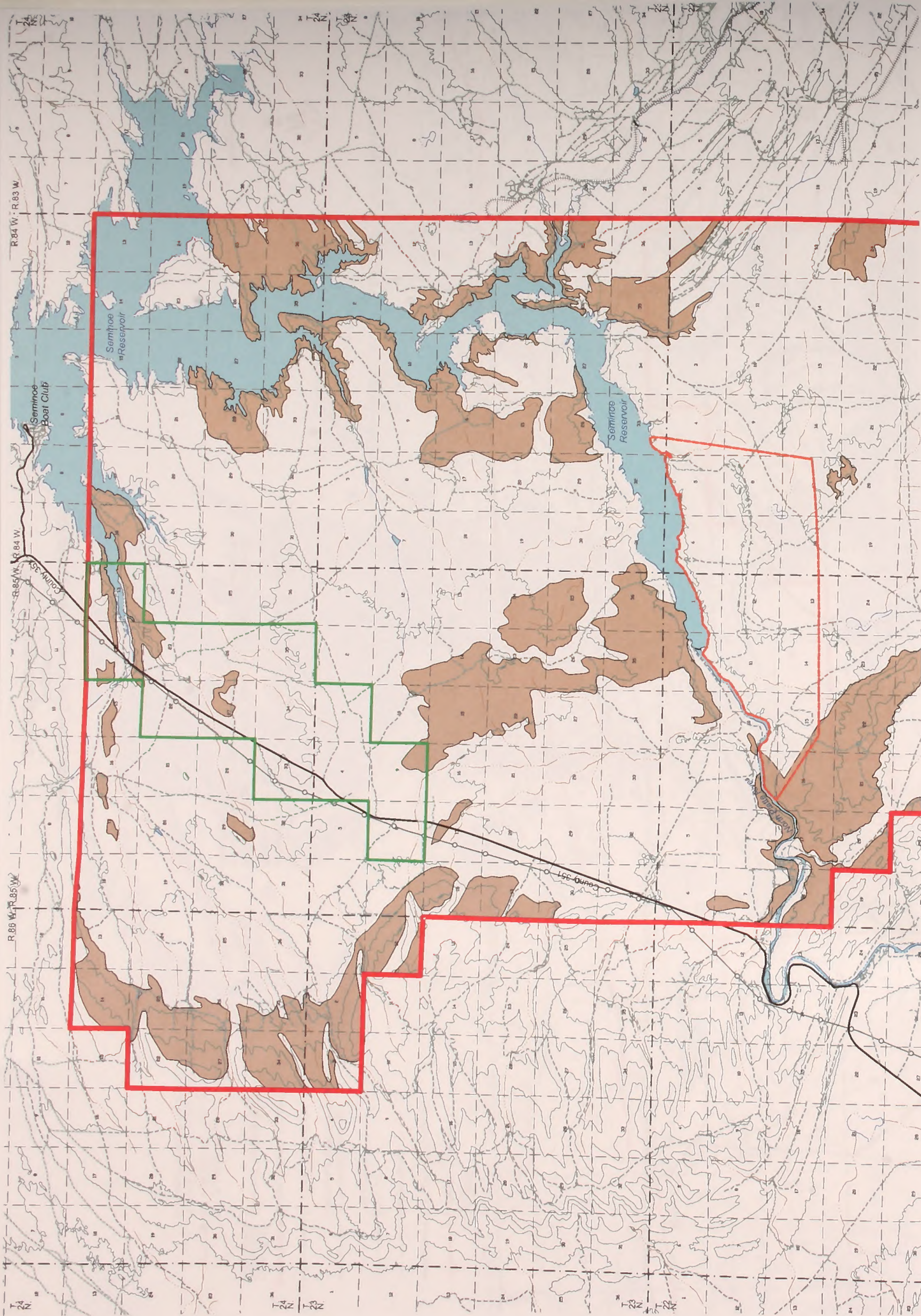
- INTERSTATE HIGHWAY
- STATE OR COUNTY HIGHWAY
- EXISTING ROADS
- RAILROAD (UNION PACIFIC)
- 115 KV TRANSMISSION LINE (WESTERN AREA POWER AUTHORITY)
- PILOT PROJECT BOUNDARY
- EIS ANALYSIS AREA BOUNDARY
- SOILS (SALT & SODIUM AFFECTED)
- OUT OF SURVEY AREA (OSA). THIS AREA HAS NOT BEEN SURVEYED FOR SOILS BY NATIONAL RESOURCE CONSERVATION SERVICE (NRCS) (FORMERLY KNOWN AS THE SOIL CONSERVATION SERVICE).

#### NOTES:

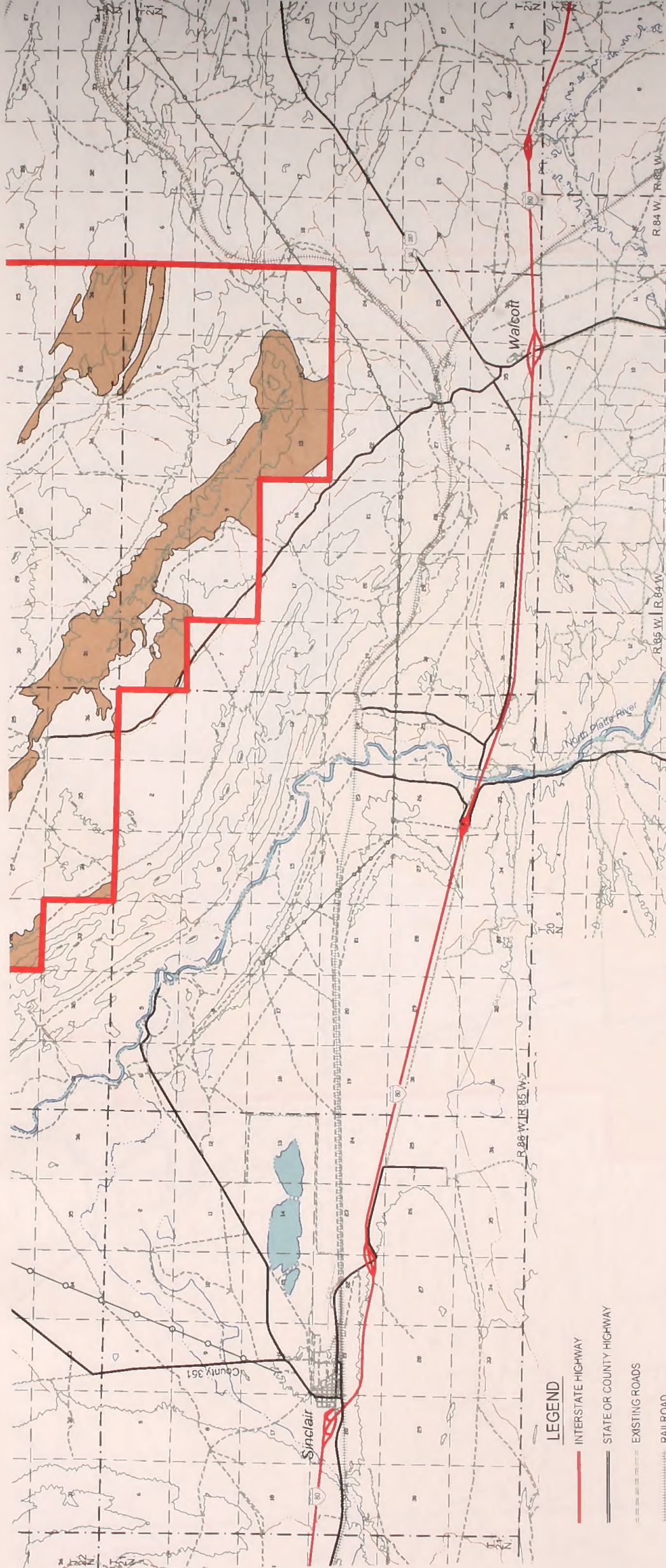
- 1 INFORMATION TAKEN FROM SOIL MAP UNIT DESCRIPTIONS, SOIL PEDON DESCRIPTIONS, AND INTERPRETIVE DATA PROVIDED BY THE BUREAU OF LAND MANAGEMENT AND NATIONAL RESOURCE CONSERVATION SERVICE.
- 2 SOIL MAP UNIT BOUNDARIES SHOWN BY DASHED LINES ARE INTERPOLATED FROM SURROUNDING FIELD DELINEATIONS AND ARE TENTATIVE UNTIL FIELD MAPPING IS COMPLETED.









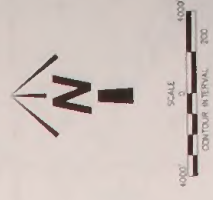


# LEGEND

- INTERSTATE HIGHWAY
- STATE OR COUNTY HIGHWAY
- EXISTING ROADS
- RAILROAD (UNION PACIFIC)
- 115 kV TRANSMISSION LINE (WESTERN AREA POWER AUTHORITY)
- PILOT PROJECT BOUNDARY
- EIS ANALYSIS AREA BOUNDARY
- SOIL MAP UNITS WHERE SLOPES WITHIN THE UNIT BOUNDARIES CAN EXCEED 15%
- OUT OF SURVEY AREA (OSA). THIS AREA HAS NOT BEEN SURVEYED FOR SOILS BY NATIONAL RESOURCE CONSERVATION SERVICE (NRCS) (FORMERLY KNOWN AS THE SOIL CONSERVATION SERVICE).

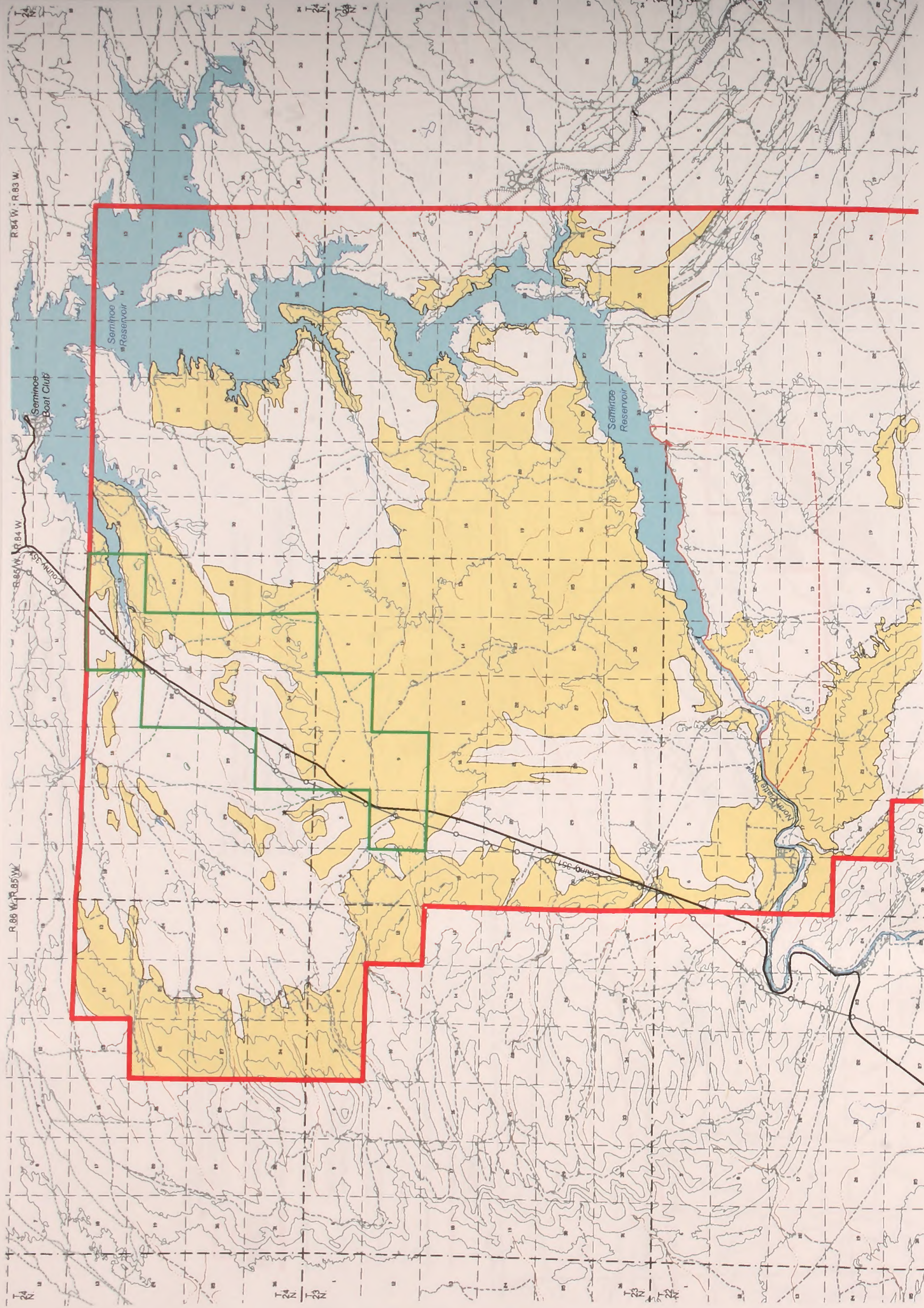
## NOTES:

- 1 INFORMATION TAKEN FROM SOIL MAP UNIT DESCRIPTIONS, SOIL PEDON DESCRIPTIONS, AND INTERPRETIVE DATA PROVIDED BY THE BUREAU OF LAND MANAGEMENT AND NATIONAL RESOURCE CONSERVATION SERVICE.
- 2 SOIL MAP UNIT BOUNDARIES SHOWN BY DASHED LINES ARE INTERPOLATED FROM SURROUNDING FIELD DELINEATIONS AND ARE TENTATIVE UNTIL FIELD MAPPING IS COMPLETED.

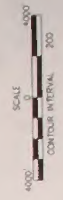
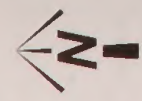
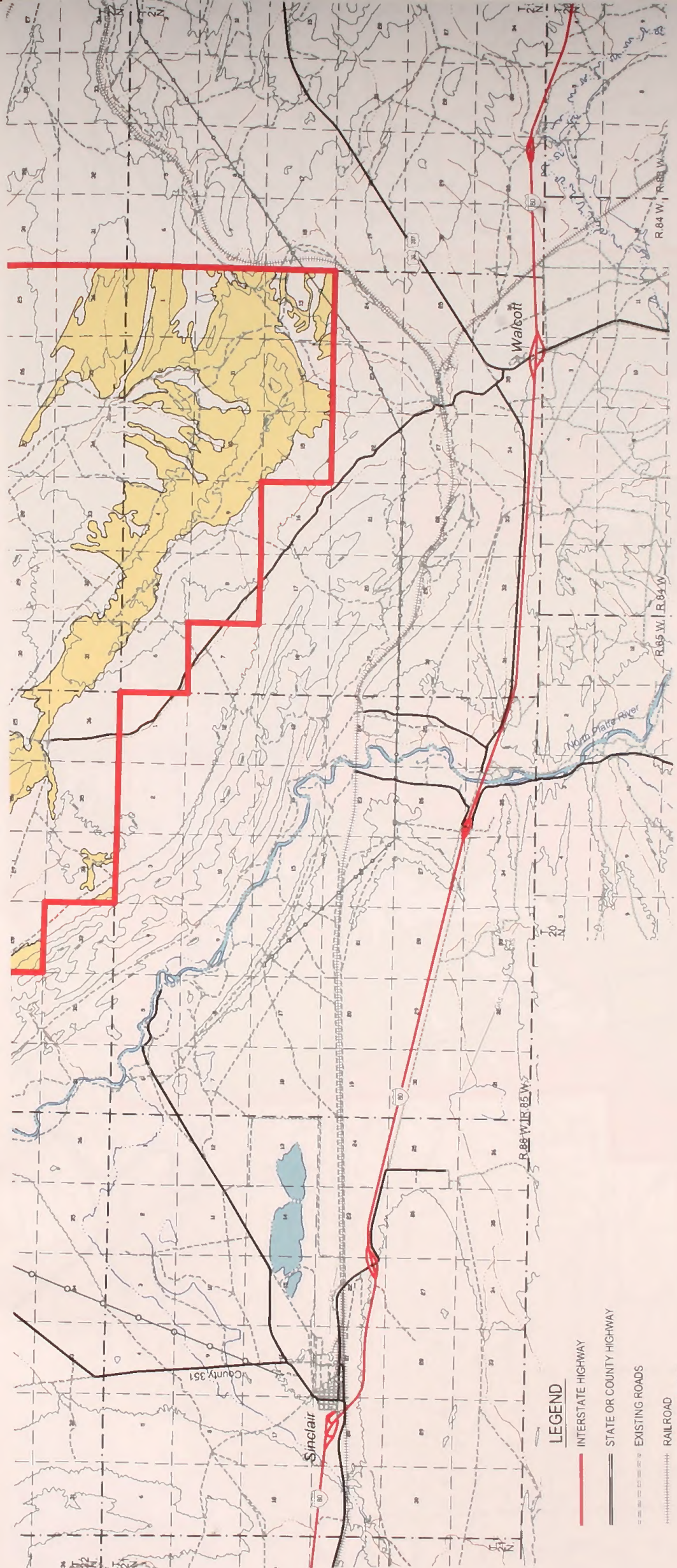


Seminole Road Gas Development Project EIS  
 FIGURE 24  
 STEEP SLOPE SOILS









# **LEGEND**

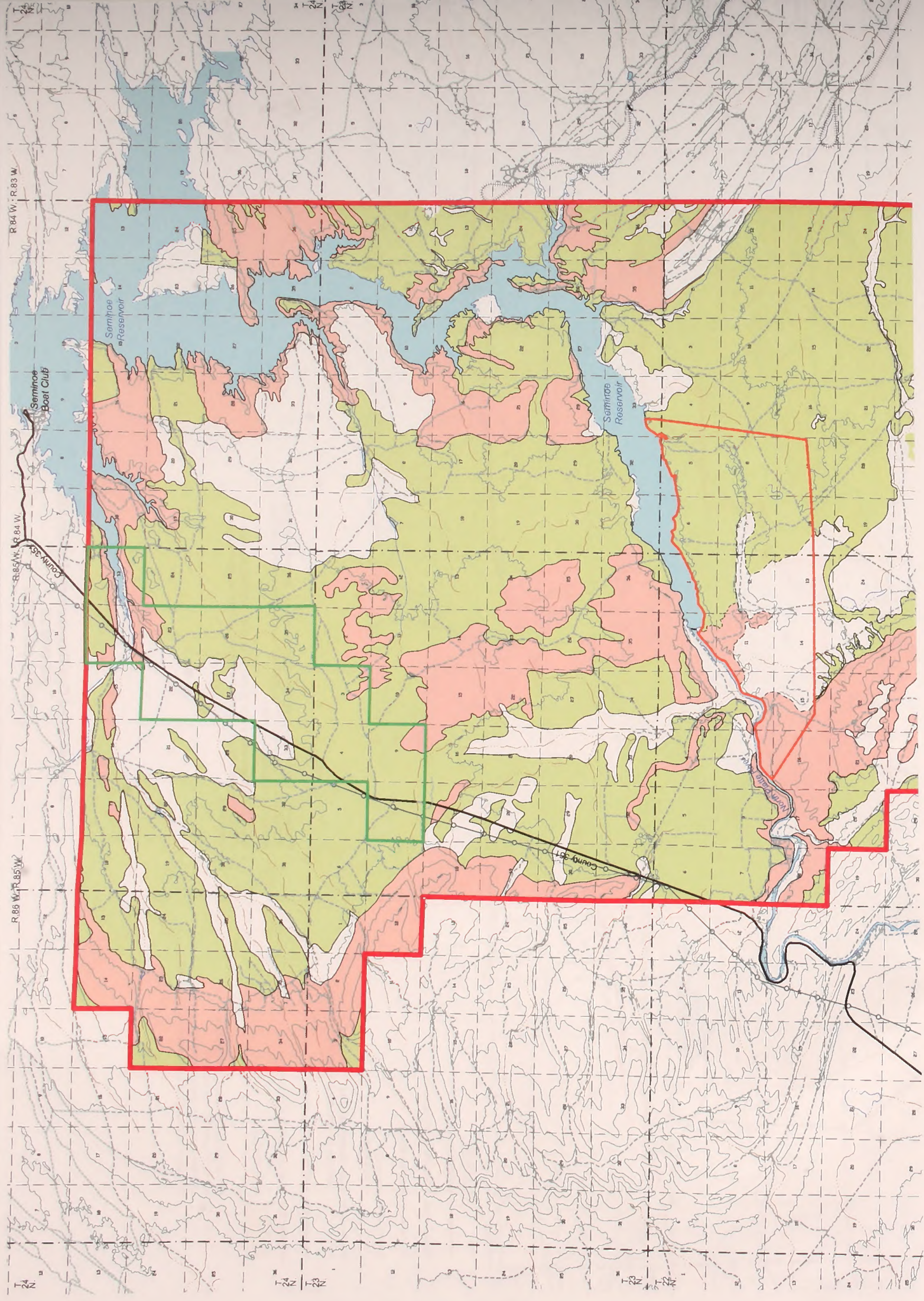
- INTERSTATE HIGHWAY
- STATE OR COUNTY HIGHWAY
- EXISTING ROADS
- RAILROAD (UNION PACIFIC)
- 115 KV TRANSMISSION LINE (WESTERN AREA POWER AUTHORITY)
- PILOT PROJECT BOUNDARY
- EIS ANALYSIS AREA BOUNDARY
- SHALLOW SOILS
- OUT OF SURVEY AREA (OSA). THIS AREA HAS NOT BEEN SURVEYED FOR SOILS BY NATIONAL RESOURCE CONSERVATION SERVICE (NRCS) (FORMERLY KNOWN AS THE SOIL CONSERVATION SERVICE).

## **NOTES:**

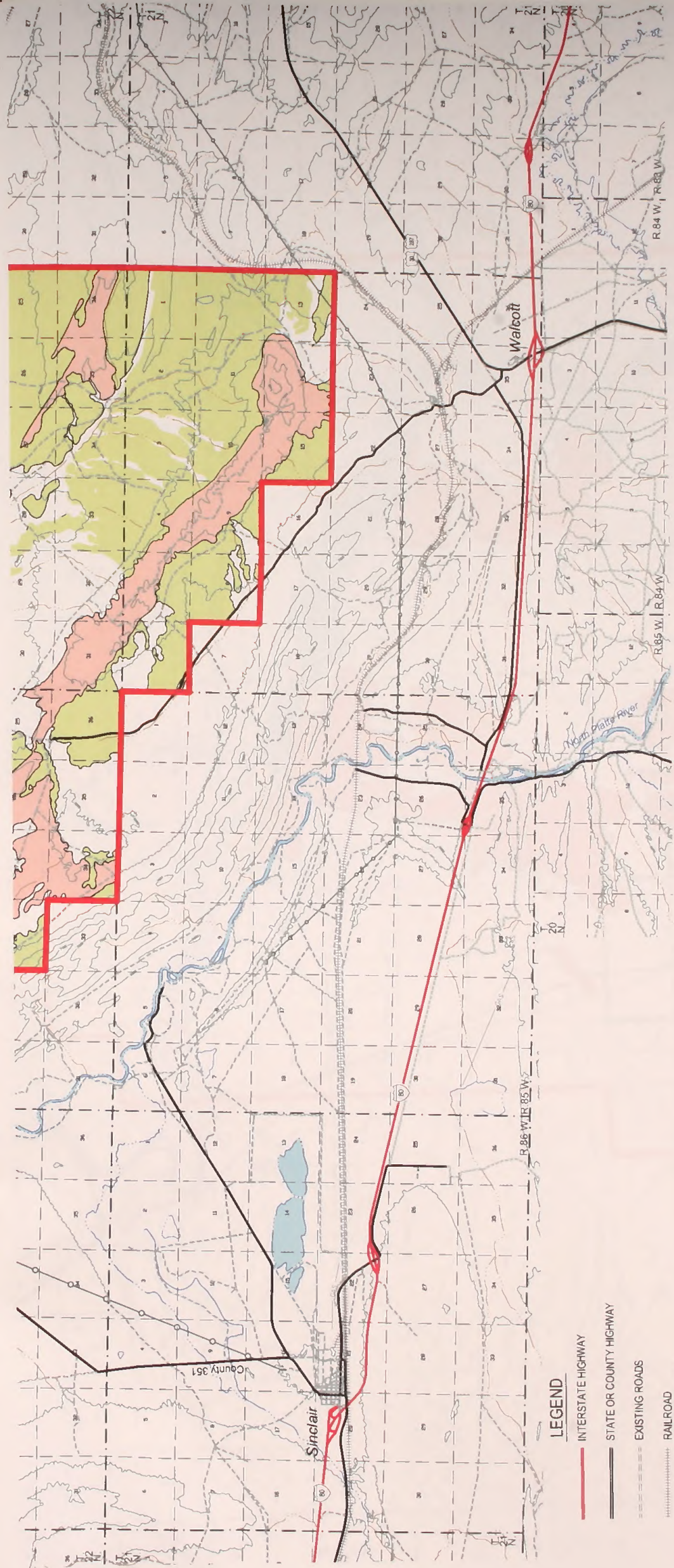
- 1 INFORMATION TAKEN FROM SOIL MAP UNIT DESCRIPTIONS, SOIL PEDON DESCRIPTIONS, AND INTERPRETIVE DATA PROVIDED BY THE BUREAU OF LAND MANAGEMENT AND NATIONAL RESOURCE CONSERVATION SERVICE
- 2 SOIL MAP UNIT BOUNDARIES SHOWN BY DASHED LINES ARE INTERPOLATED FROM SURROUNDING FIELD DELINEATIONS AND ARE TENTATIVE UNTIL FIELD MAPPING IS COMPLETED.

**Seminole Road Gas Development Project EIS**  
**FIGURE 25**  
**SHALLOW SOILS**









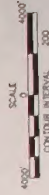
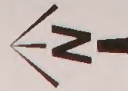
# LEGEND

- INTERSTATE HIGHWAY
- STATE OR COUNTY HIGHWAY
- EXISTING ROADS
- RAILROAD (UNION PACIFIC)
- 115 KV TRANSMISSION LINE (WESTERN AREA POWER AUTHORITY)
- PILOT PROJECT BOUNDARY
- EIS ANALYSIS AREA BOUNDARY
- SOILS WITH SEVERE EROSION POTENTIAL
- SOILS WITH SLIGHT TO SEVERE EROSION POTENTIAL

OUT OF SURVEY AREA (OSA). THIS AREA HAS NOT BEEN SURVEYED FOR SOILS BY NATIONAL RESOURCE CONSERVATION SERVICE (NRCS) (FORMERLY KNOWN AS THE SOIL CONSERVATION SERVICE).

## NOTES:

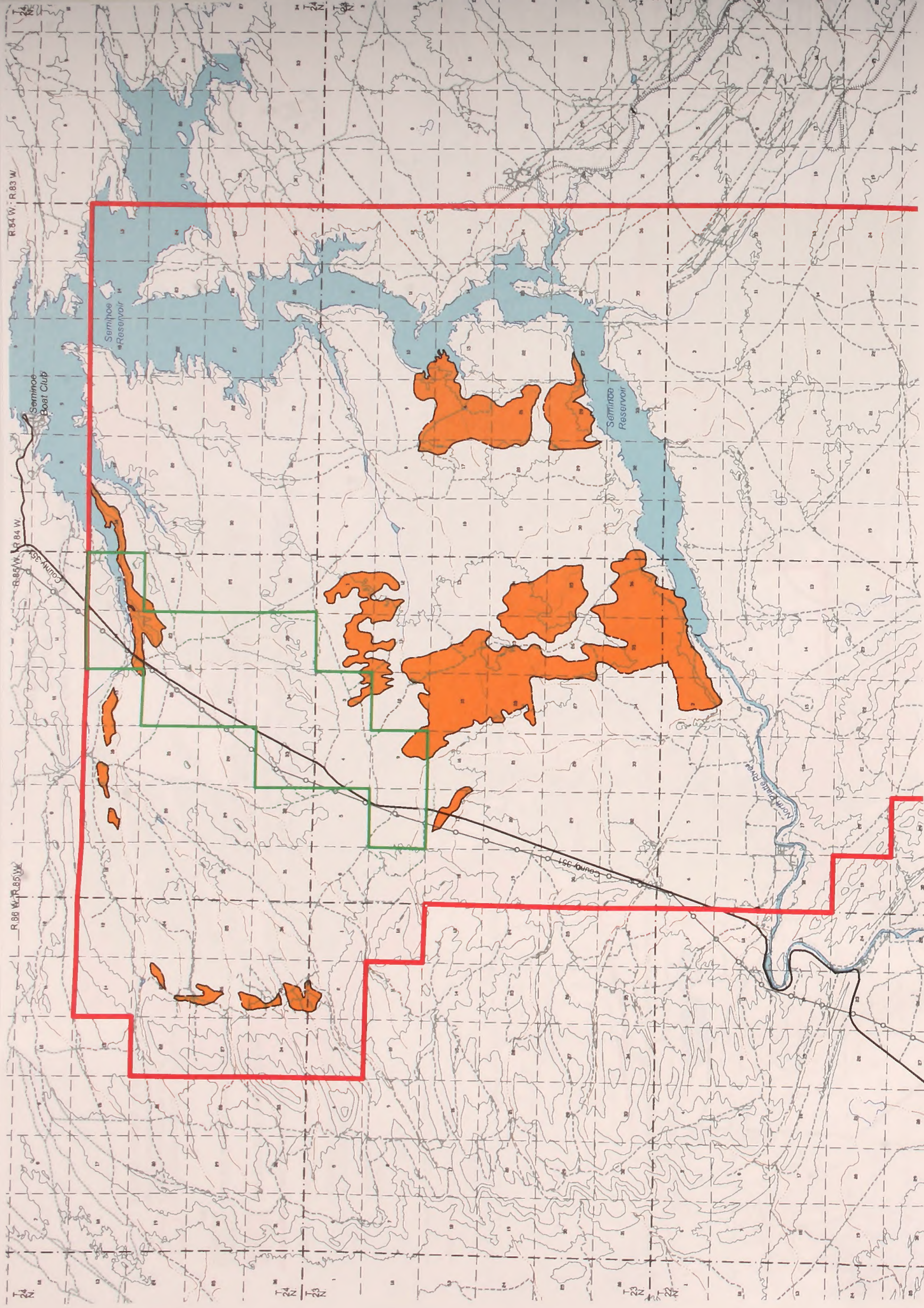
- 1 INFORMATION TAKEN FROM SOIL MAP UNIT DESCRIPTIONS, SOIL PEDON DESCRIPTIONS, AND INTERPRETIVE DATA PROVIDED BY THE BUREAU OF LAND MANAGEMENT AND NATIONAL RESOURCE CONSERVATION SERVICE.
- 2 SOIL MAP UNIT BOUNDARIES SHOWN BY DASHED LINES ARE INTERPOLATED FROM SURROUNDING FIELD DELINEATIONS AND ARE TENTATIVE UNTIL FIELD MAPPING IS COMPLETED.



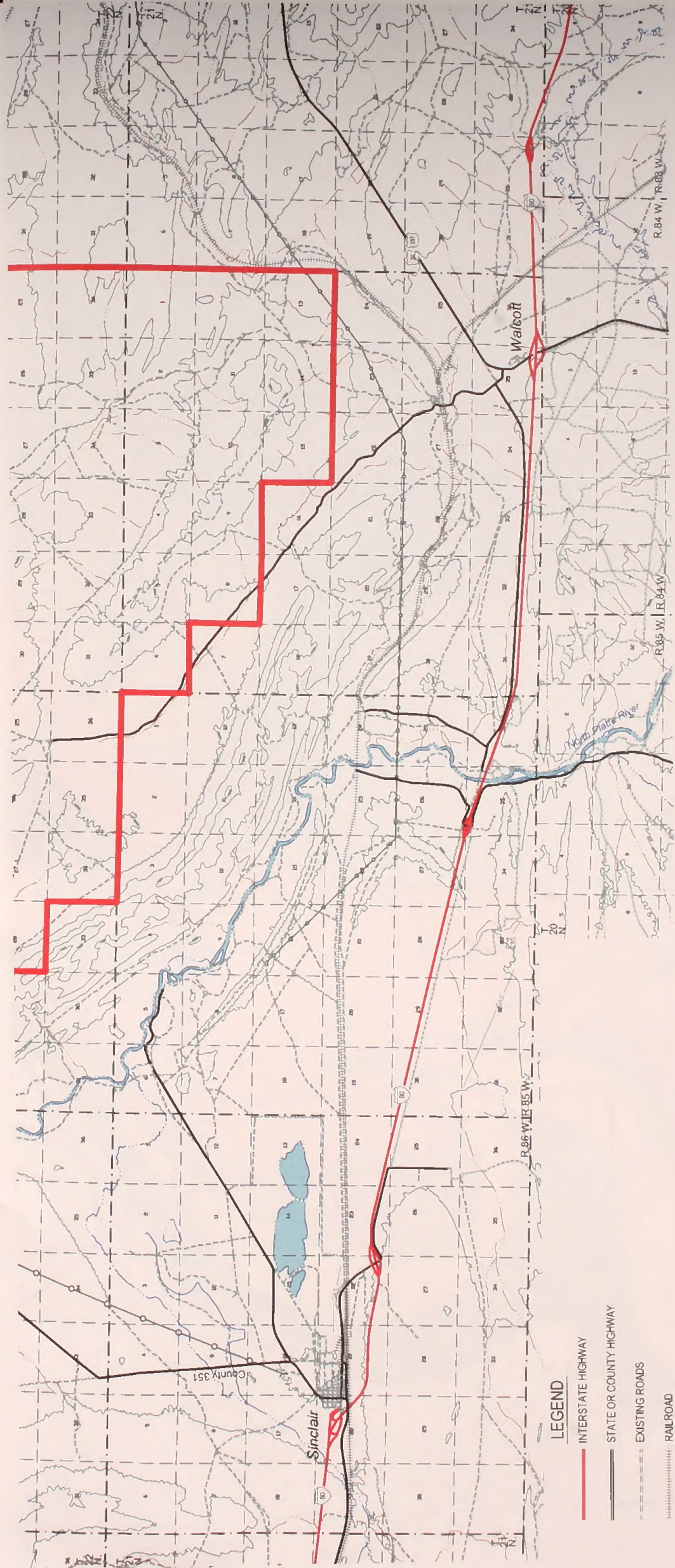
## Seminole Road Gas Development Project EIS

FIGURE 26  
ERODIBLE SOILS







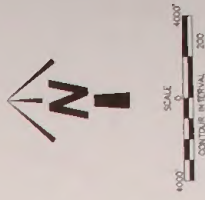


# LEGEND

- INTERSTATE HIGHWAY
- STATE OR COUNTY HIGHWAY
- EXISTING ROADS
- RAILROAD (UNION PACIFIC)
- 115 KV TRANSMISSION LINE (WESTERN AREA POWER AUTHORITY)
- PILOT PROJECT BOUNDARY
- EIS ANALYSIS AREA BOUNDARY
- AREA WHERE SALINE/SODIUM SOILS, SHALLOW SOILS, AND SOILS WITH SEVERE EROSION POTENTIAL COINCIDE

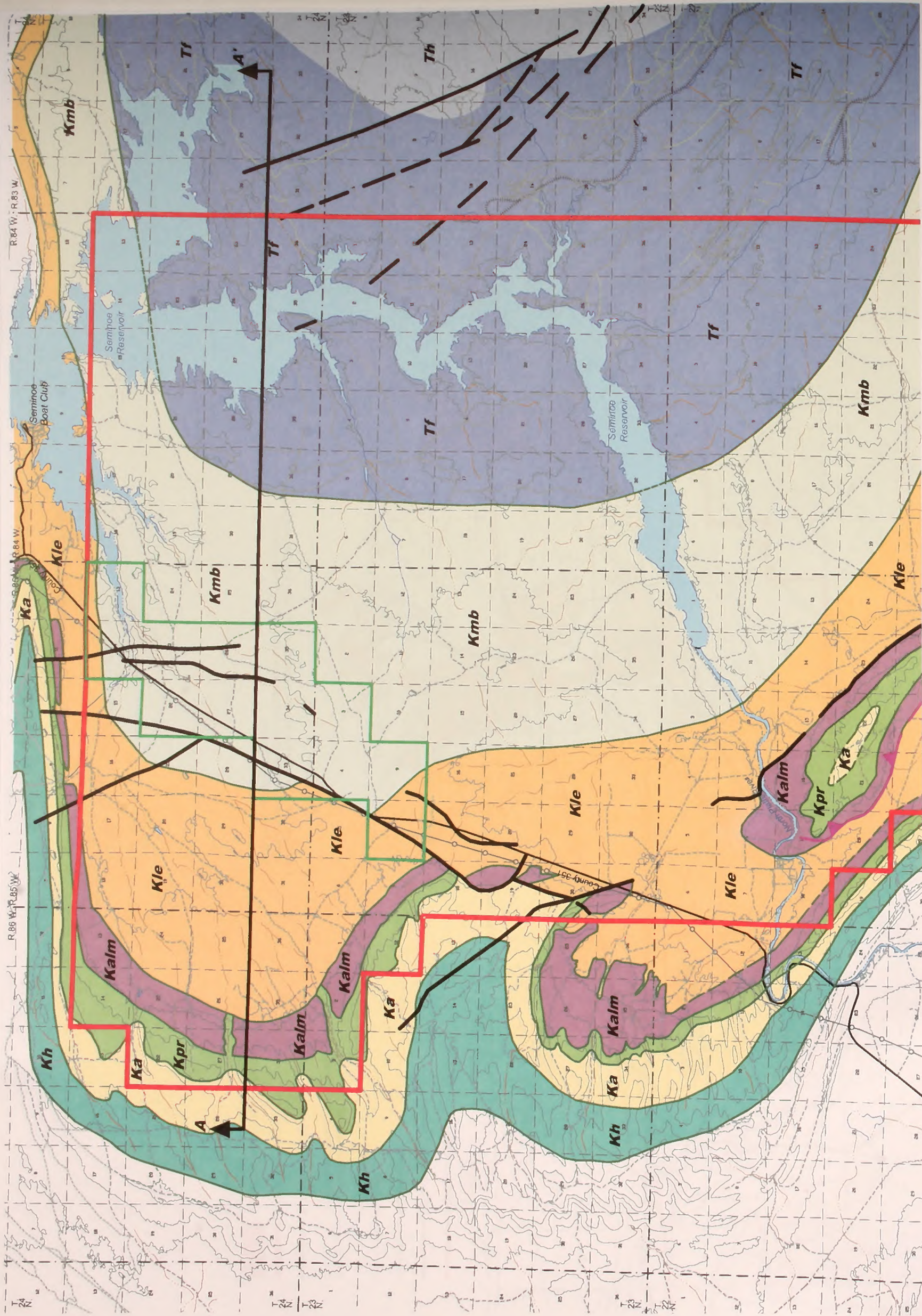
## NOTES:

1 INFORMATION TAKEN FROM SOIL MAP UNIT DESCRIPTIONS, SOIL PEDON DESCRIPTIONS, AND INTERPRETIVE DATA PROVIDED BY THE BUREAU OF LAND MANAGEMENT AND NATIONAL RESOURCE CONSERVATION SERVICE.

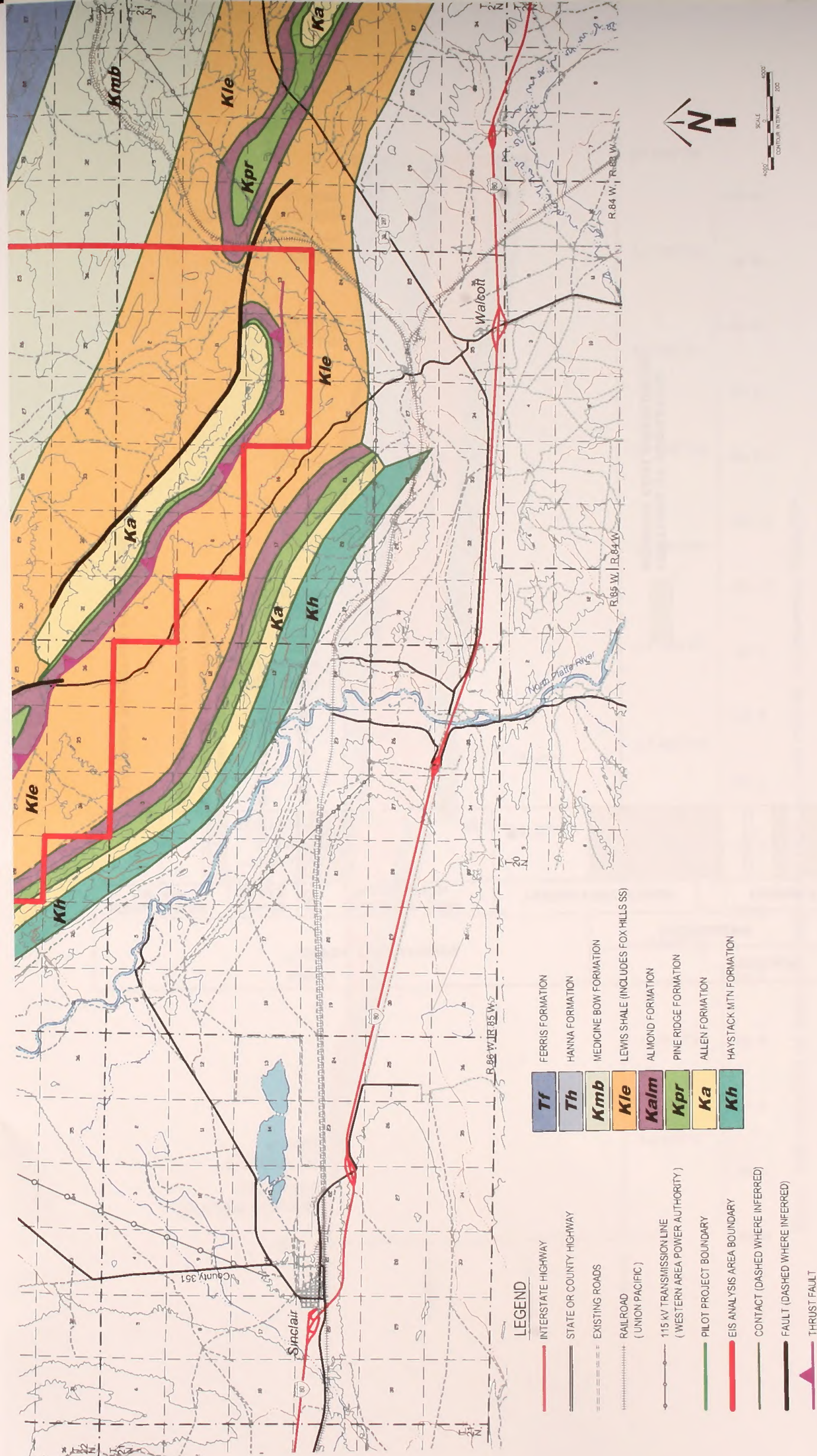


Seminole Road Gas Development Project EIS  
 FIGURE 27  
 AREAS OF SENSITIVE SOIL CONCENTRATIONS







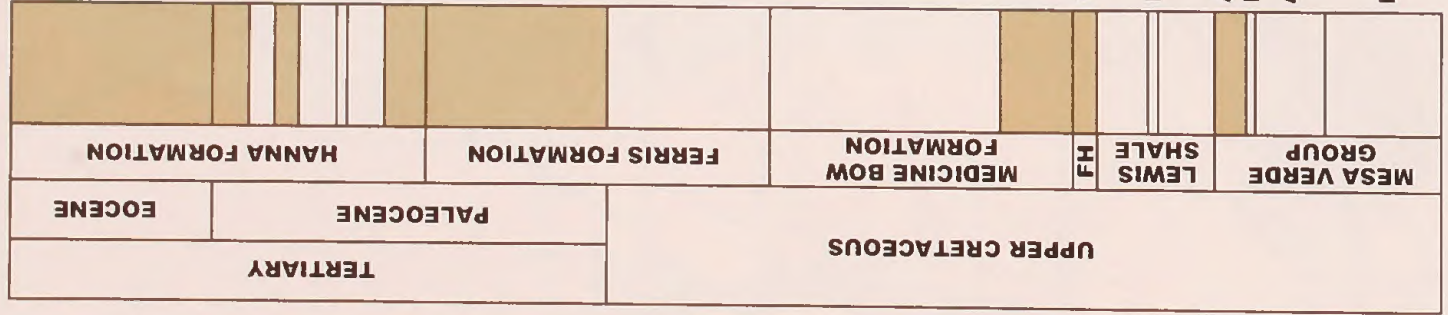


NOTE: (1) THIS MAP ILLUSTRATES THE EXPRESSION OF SURFACE GEOLOGY  
 (2) SEE FIGURE 29, GENERAL STRATIGRAPHIC COLUMN AND GEOLOGIC CROSS-SECTION A-A'

Seminole Road Gas Development Project EIS  
 FIGURE 28  
 REGIONAL GEOLOGY

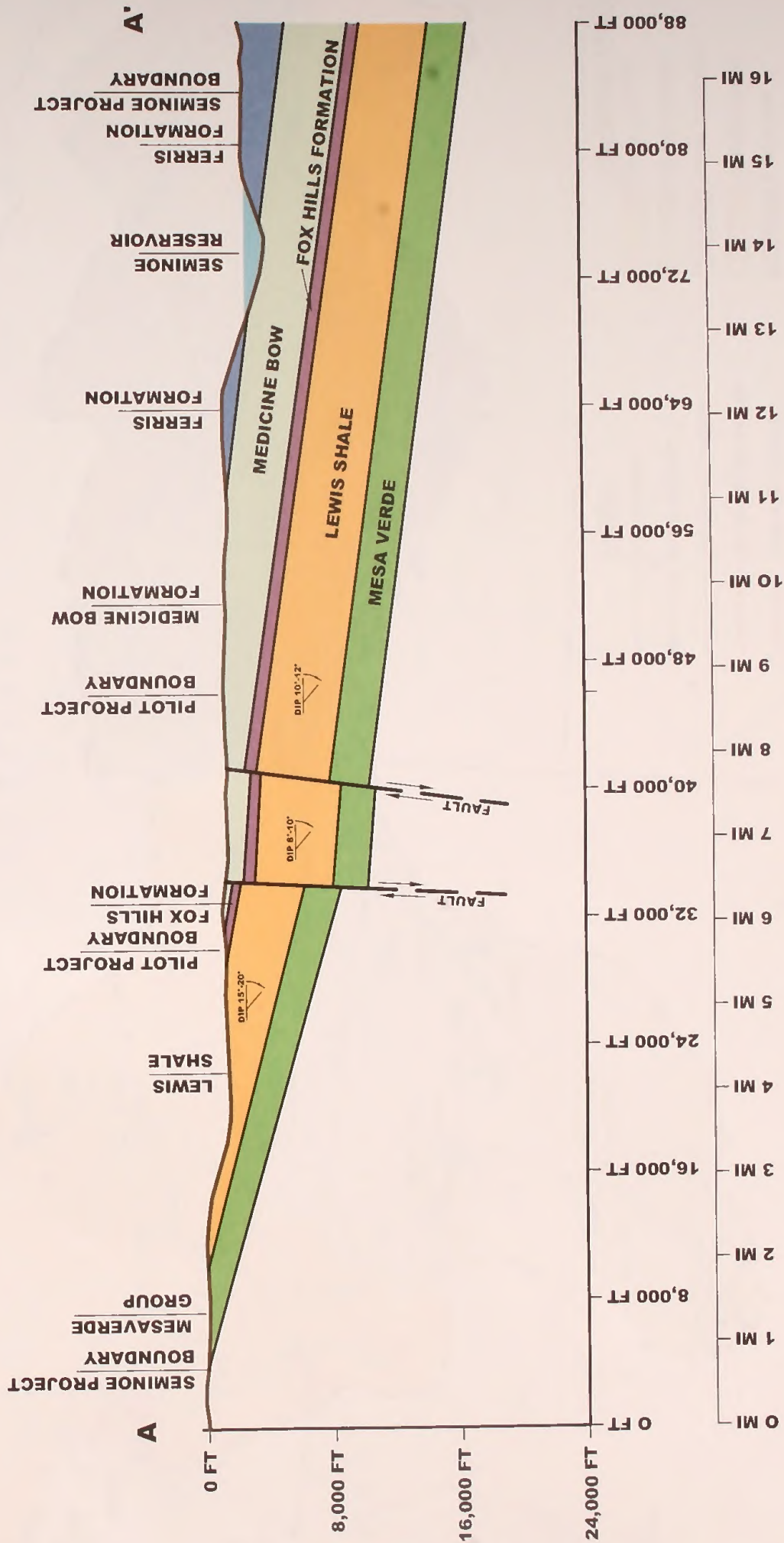


HANNA BASIN



PORTIONS OF FORMATION  
BEARING COAL RESOURCES





NOTE: FOR LOCATION OF GEOLOGIC CROSS SECTION A-A', SEE FIGURE 28, REGIONAL GEOLOGY



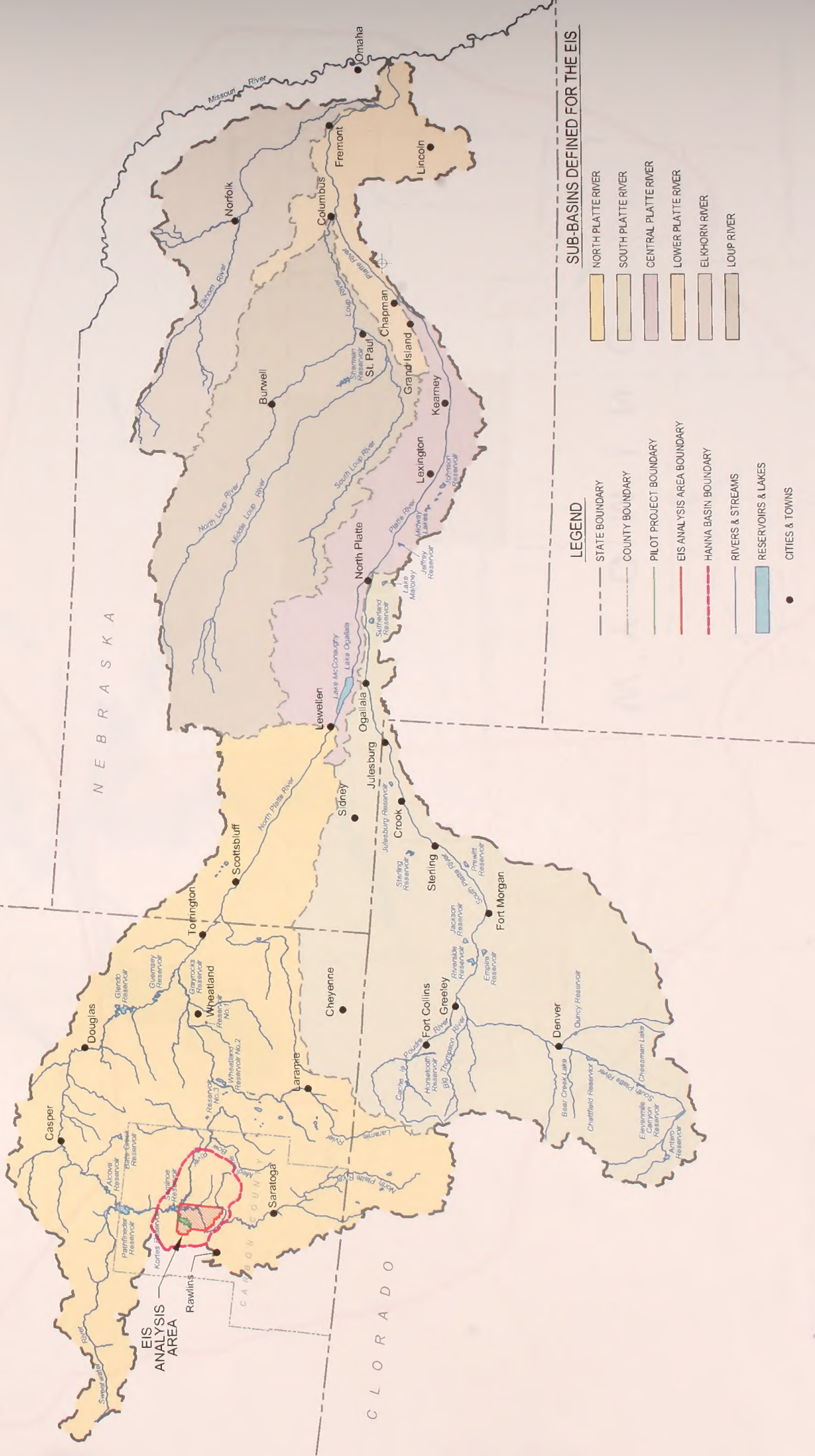




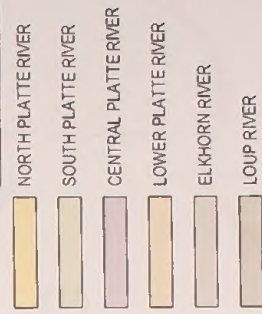
W Y O M I N G

N E B R A S K A

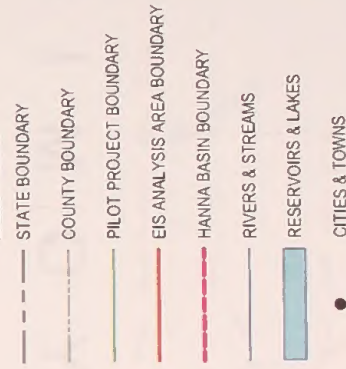
C O L O R A D O



SUB-BASINS DEFINED FOR THE EIS



LEGEND



Seminole Road Gas Development Project EIS

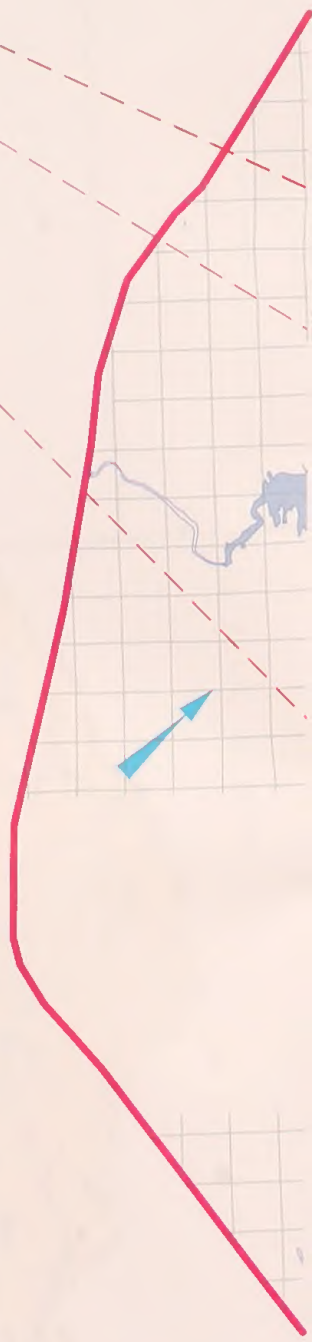
FIGURE 30

PLATTE RIVER DRAINAGE BASIN

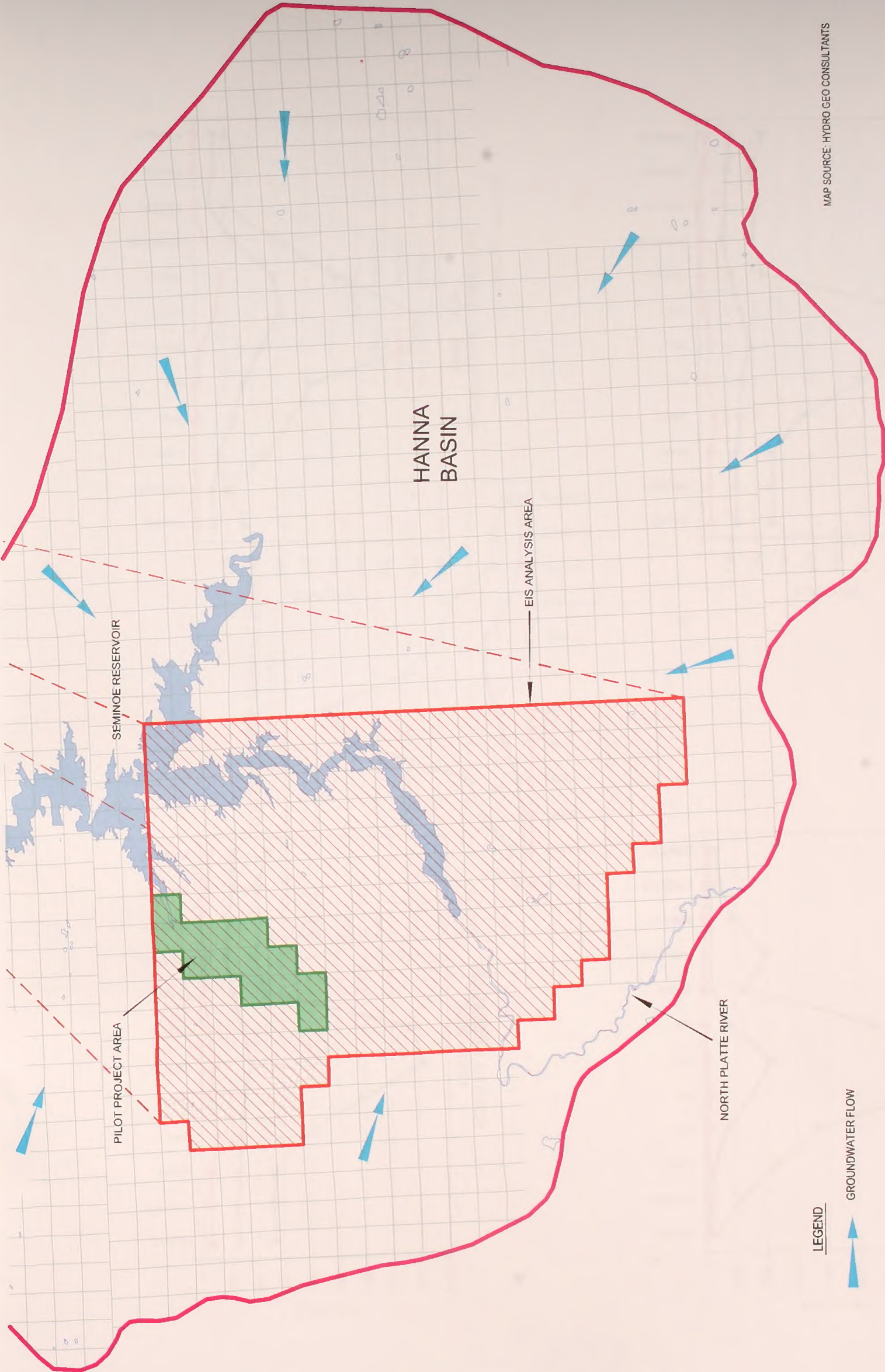




CARBON COUNTY







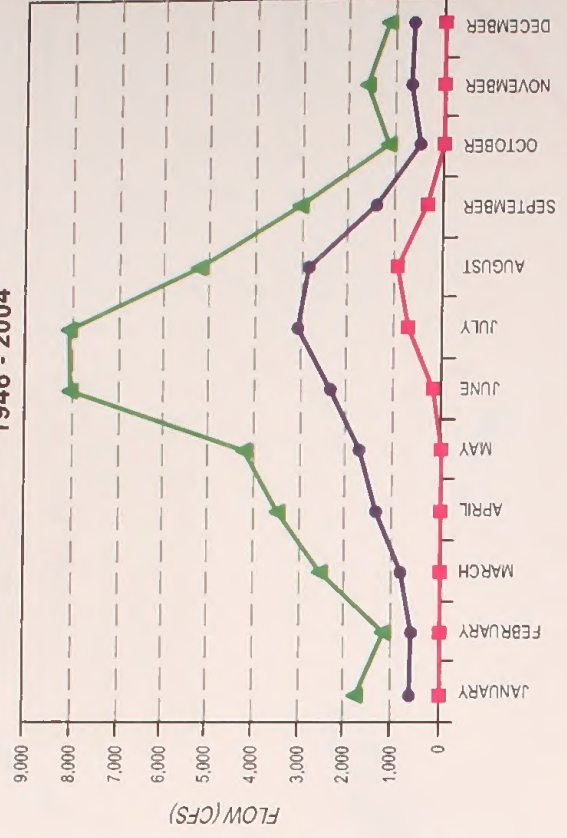
Seminole Road Gas Development Project EIS  
FIGURE 31  
HANNA BASIN



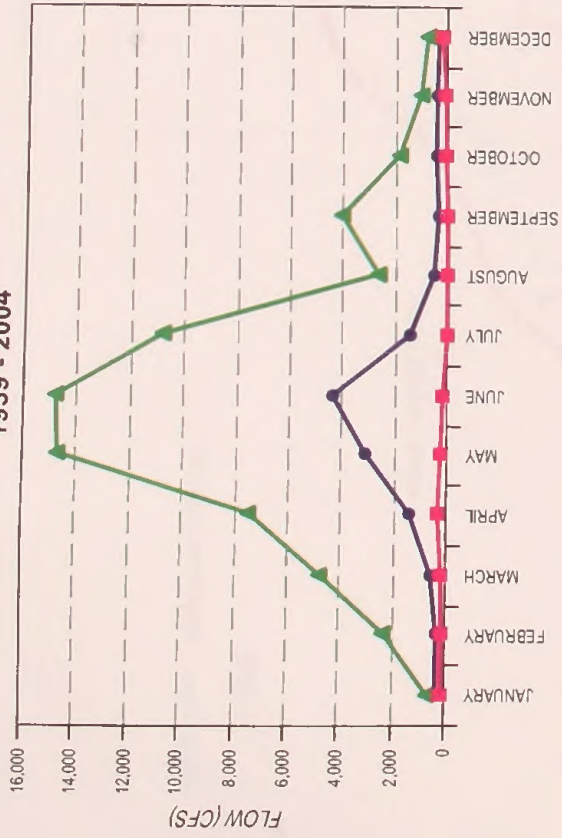
SEMINOE RESERVOIR  
1946 - 2004



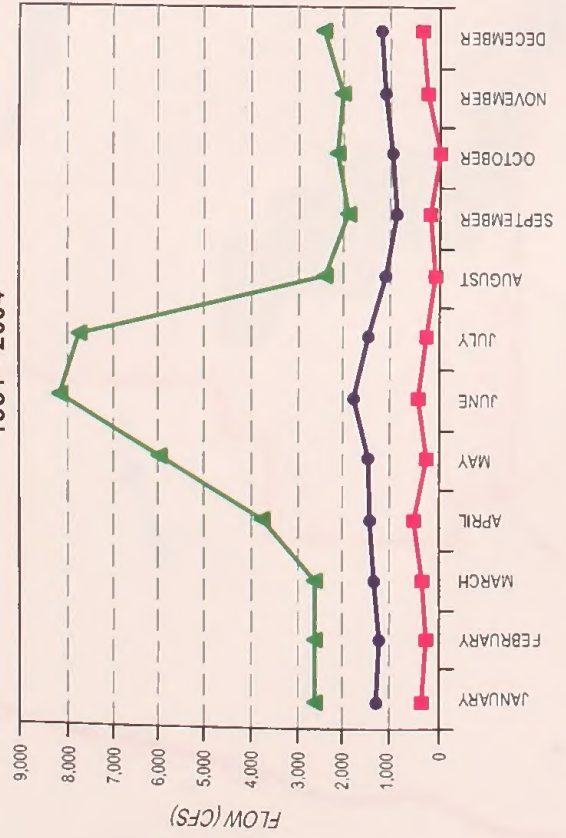
PATHFINDER RESERVOIR  
1946 - 2004



NORTH PLATTE RIVER ABOVE SEMINOE  
1939 - 2004

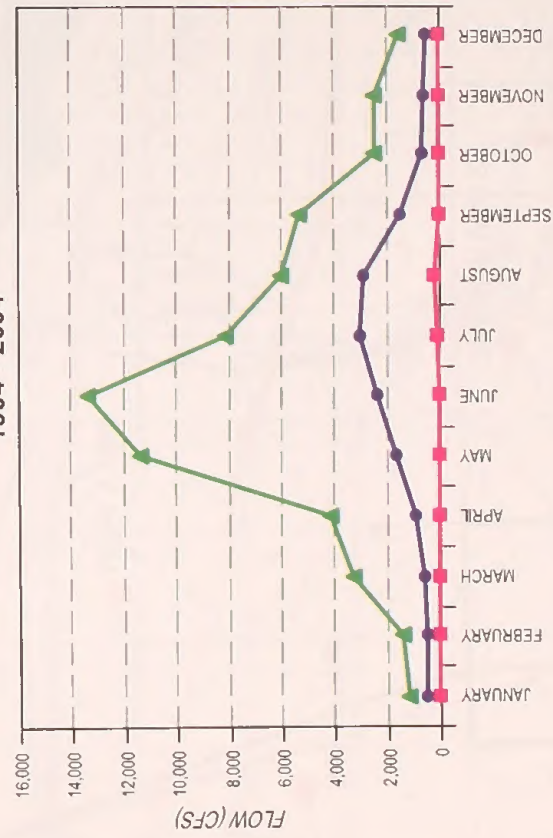


KORTES RESERVOIR  
1951 - 2004





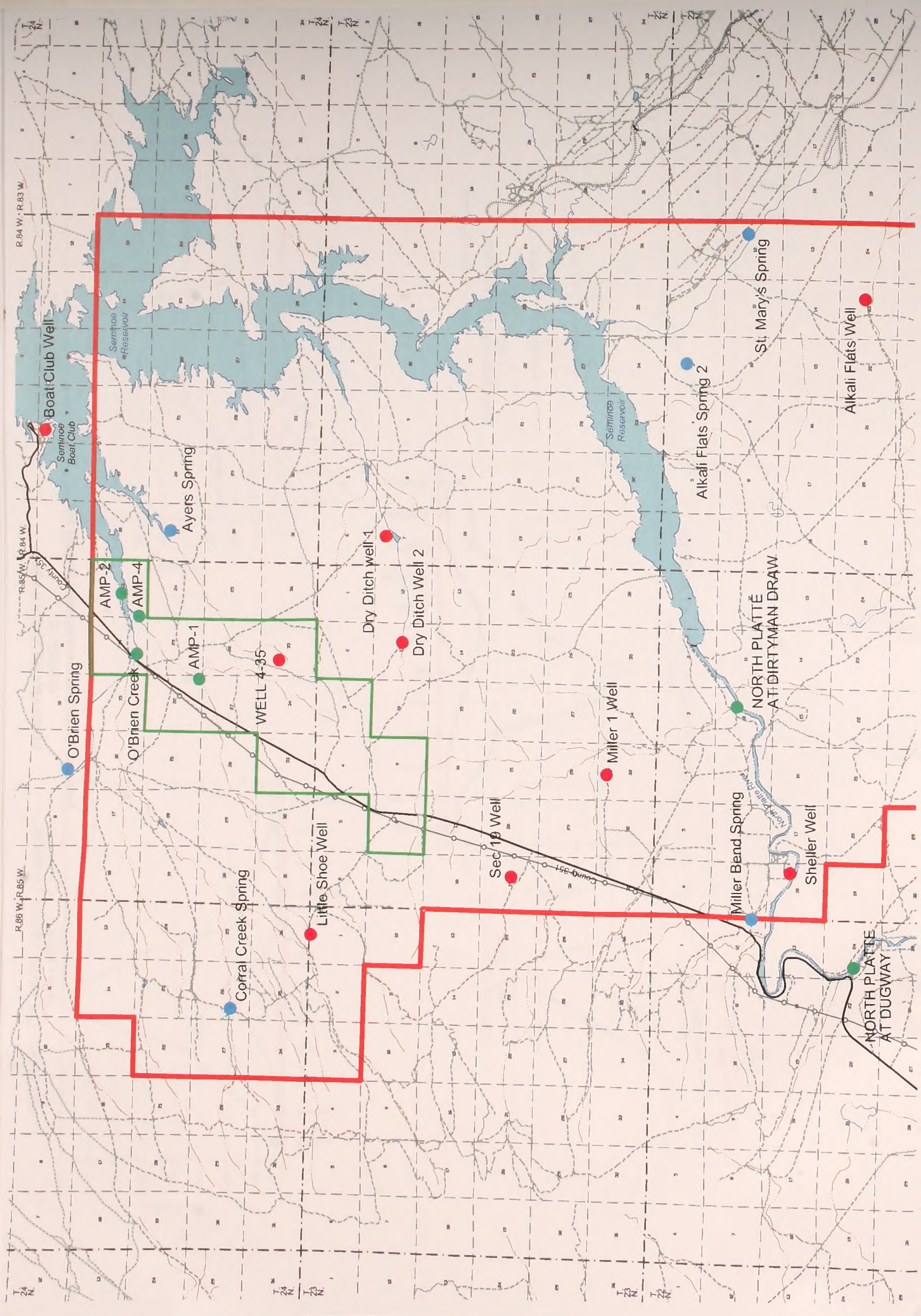
# NORTH PLATTE RIVER AT ALCOVA 1904 - 2004



LEGEND  
 AVERAGE  
 MINIMUM  
 MAXIMUM

SOURCE: HYDRO GEO CONSULTANTS









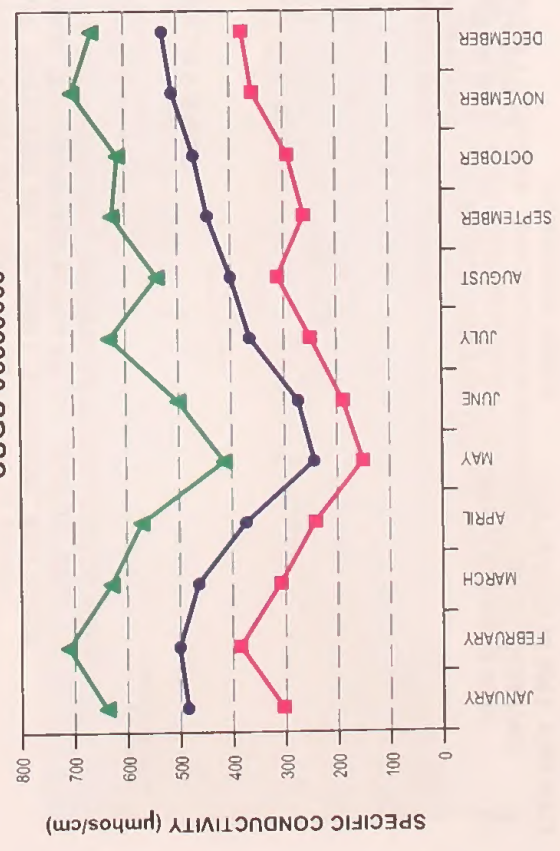
Seminole Road Gas Development Project EIS  
**FIGURE 33**  
 HYDROLOGIC MONITORING SITES LOCATION MAP



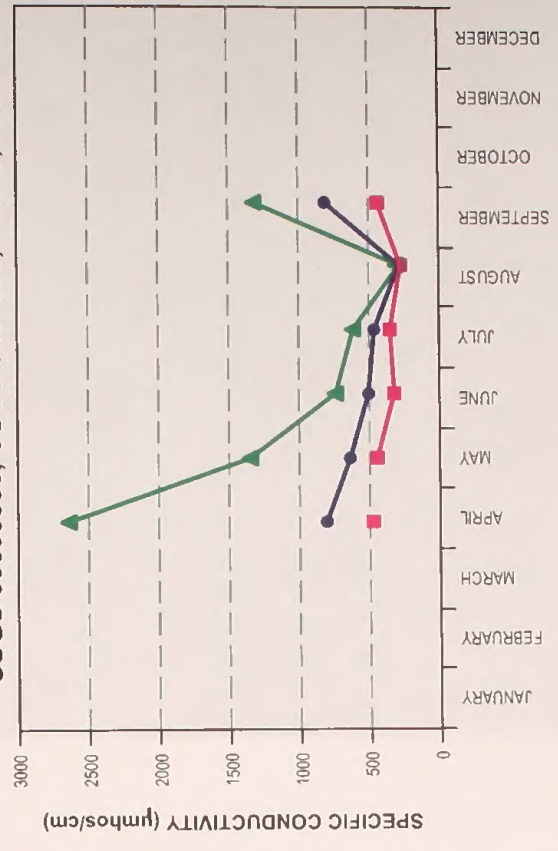




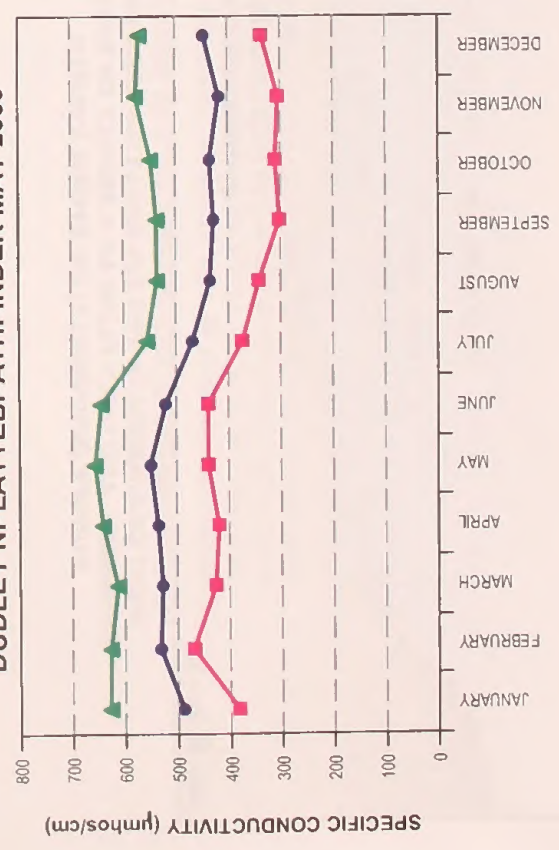
**NORTH PLATTE RIVER ABOVE SEMINOE**  
USGS 06630000



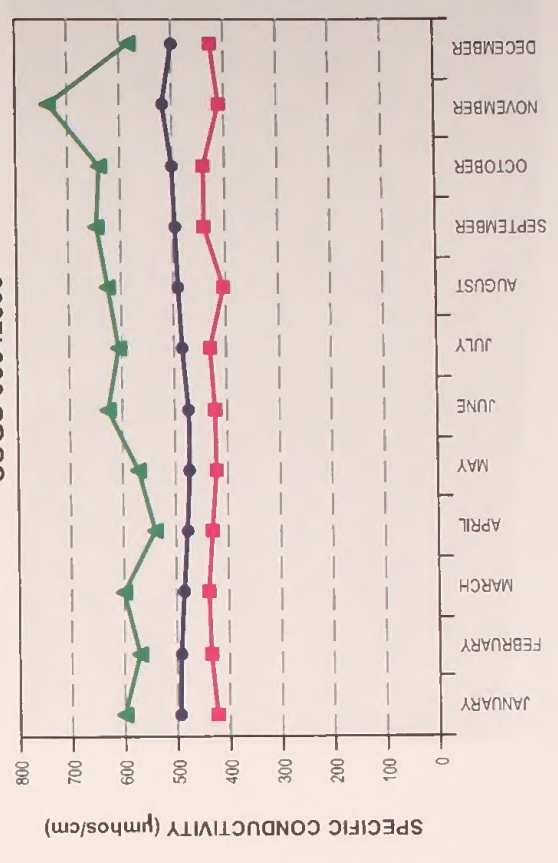
**SEMINOE RESERVOIR**  
USGS 06630350, USGS 0635500, AMP-2, AMP-3



**NORTH PLATTE ABOVE PATHFINDER RESERVOIR**  
USGS 06636000 AUGUST 1969 - JULY 1989  
DUDLEY NPLATTEPATHFINDER MAY 2003



**NORTH PLATTE RIVER AT ALCOVA**  
USGS 06642000



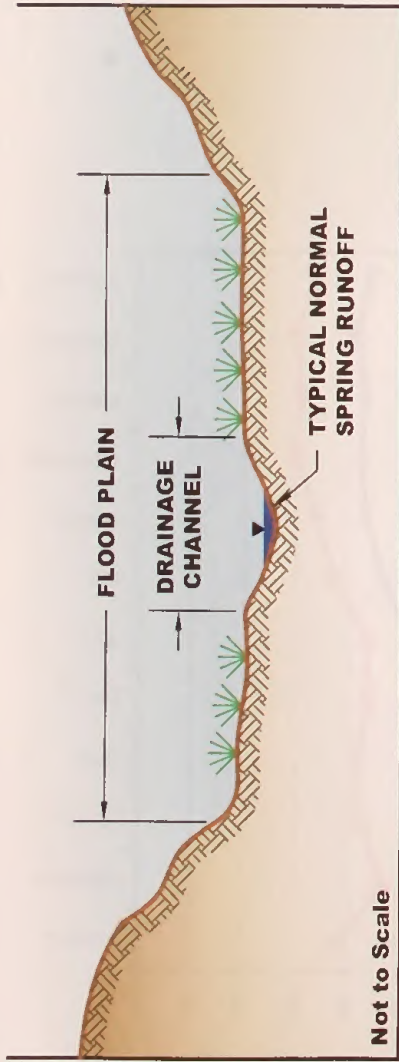
**LEGEND**

- AVERAGE
- MINIMUM
- ▲— MAXIMUM

NOTE: THERE IS NO WATER QUALITY DATA AVAILABLE FOR KORTES RESERVOIR OR MIRACLE MILE  
SOURCE: HYDRO GEO CONSULTANTS

**Seminole Road Gas Development Project EIS**  
**FIGURE 34**  
**SUMMARY OF SURFACE WATER SALINITY DATA**

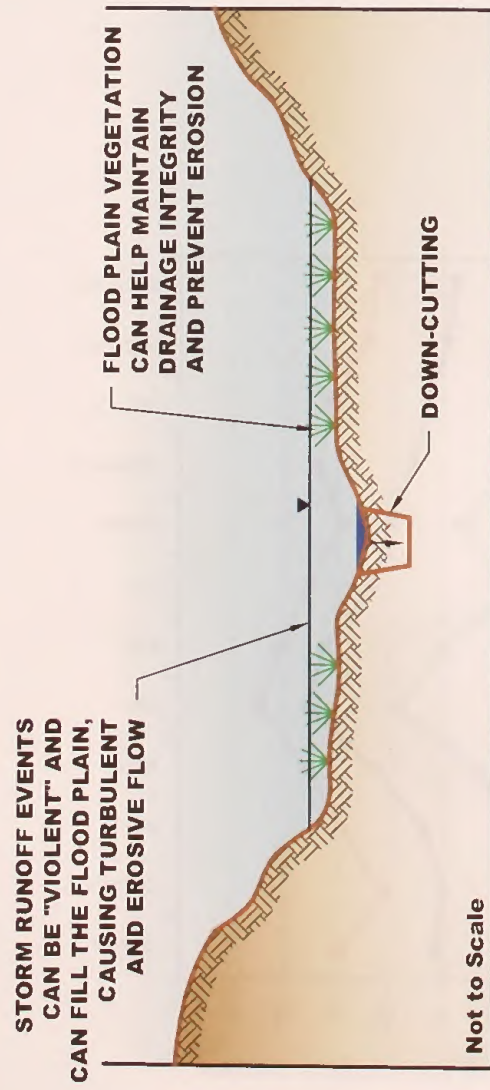




MOST DRAINAGES IN THE EIS ANALYSIS AREA ARE EPHERMAL AND ONLY FLOW AS A RESULT OF SPRING RUNOFF (SNOWMELT) OR STORM EVENTS.



TYPICAL DRAINAGE IN THE SEMINOLE ROAD PROJECT EIS ANALYSIS AREA.



STORM RUNOFF EVENTS CAN BE "VIOLENT" AND CAN FILL THE FLOOD PLAIN, CAUSING TURBULENT AND EROSIVE FLOW

FLOOD PLAIN VEGETATION CAN HELP MAINTAIN DRAINAGE INTEGRITY AND PREVENT EROSION

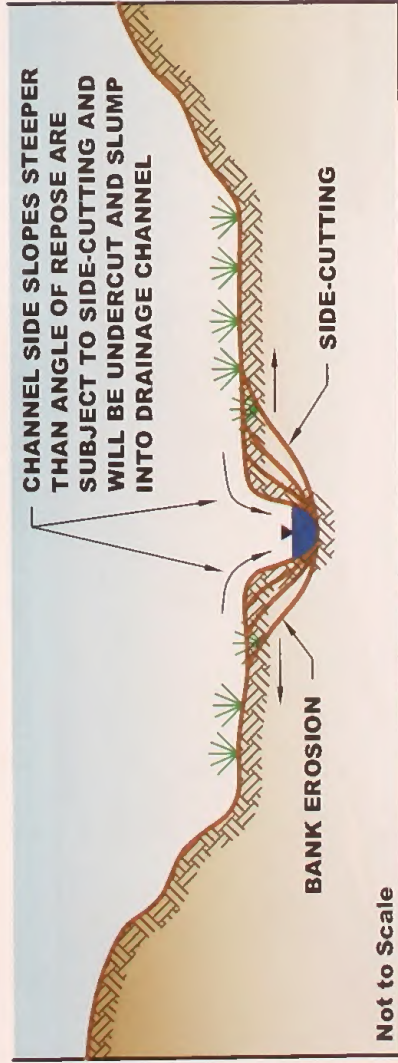
DOWN-CUTTING

WITH DOWNSTREAM SCOURING, THE DRAINAGE SYSTEM WILL ADJUST TO AN EQUILIBRIUM STATE. THIS INVOLVES "DOWN-CUTTING" IN THE DRAINAGE GIVEN ADDED FLOOD ENERGY AND FLOW VELOCITIES. SEDIMENT MOVED DOWN DRAINAGE.



NATURAL DRAINAGE FLOODING AND DOWN-CUTTING AS A RESULT OF STORM RUNOFF. NOTE: SURFACE RUNOFF AND PIPING ON EDGE OF THE HEADCUT.





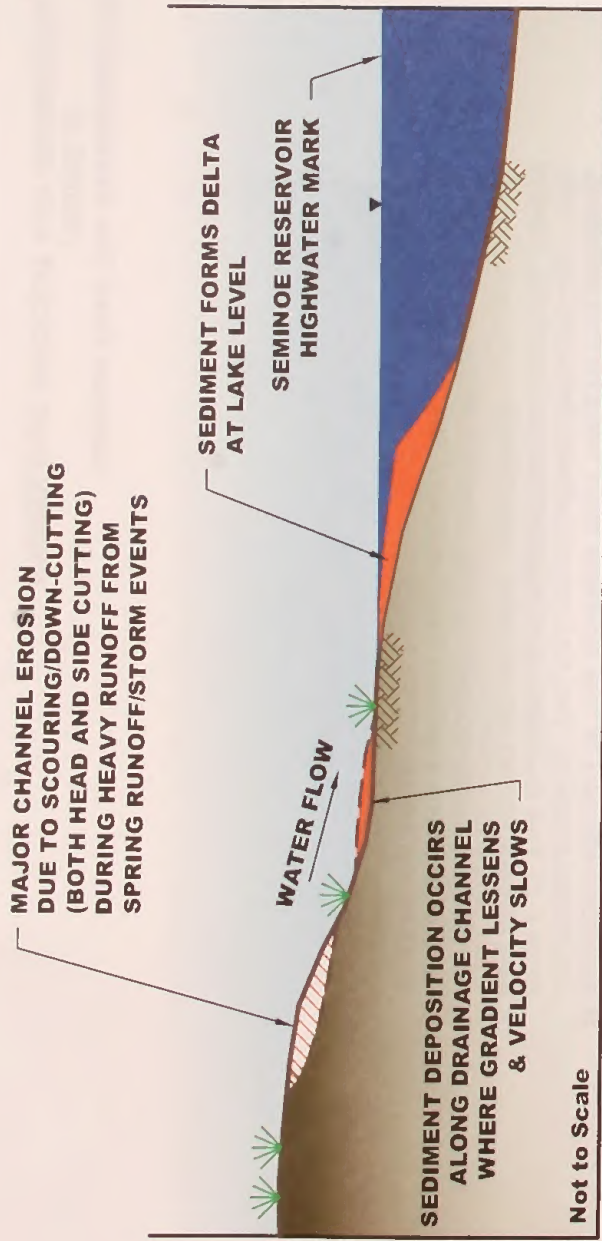
WITH DOWN-CUTTING, THERE WILL ALSO BE SIDE-CUTTING OF THE DRAINAGE. THIS IS PART OF THE SYSTEM SEEKING EQUILIBRIUM. SEDIMENT MOVED DOWN DRAINAGE.

NATURAL DRAINAGE SIDE-CUTTING AS A RESULT OF STORM RUNOFF.

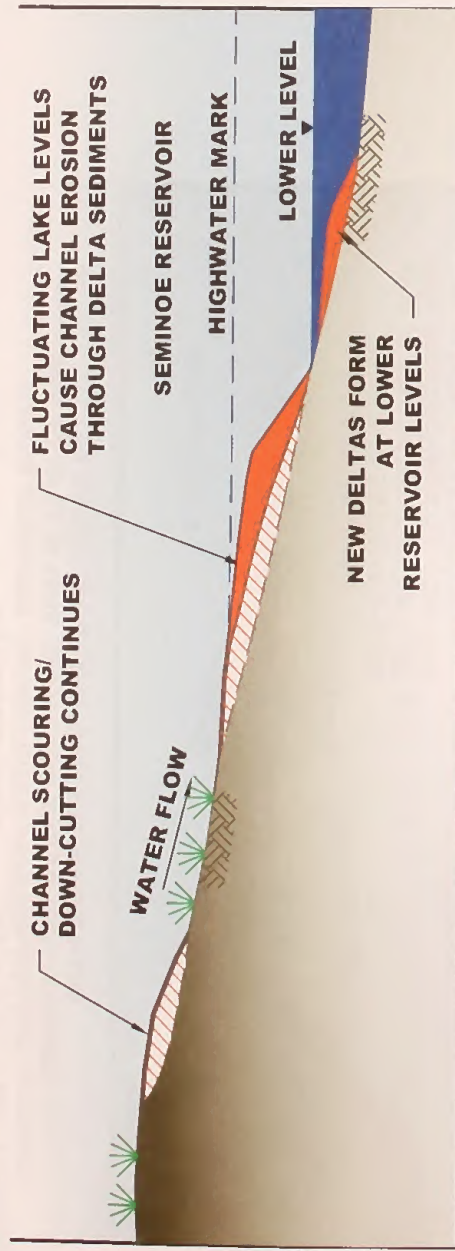
#### NOTES:

- 1) GEOMORPHIC CYCLE IS THE CYCLE OF EROSION.
- 2) GEOMORPHOLOGY IS THE SCIENCE THAT TREATS THE GENERAL CONFIGURATION OF THE EARTH'S SURFACE, SPECIFICALLY THE STUDY OF THE CLASSIFICATION, DESCRIPTION, NATURE, ORIGIN AND DEVELOPMENT OF PRESENT LANDFORMS.
- 3) FLUVIAL GEOMORPHOLOGY IS THE GENERAL CONFIGURATION OF THE EARTH'S SURFACE PRODUCED BY THE ACTION OF A STREAM OR RIVER.





THE DRAINAGES WITHIN THE EIS ANALYSIS AND SURROUNDING AREAS ARE SUBJECT TO NATURAL EROSION AND SEDIMENT DEPOSITION PROCESSES. SURFACE DRAINAGES CONTINUALLY SEEK EQUILIBRIUM. THE DEVELOPMENT AND OPERATION OF THE SEMINOE RESERVOIR INTRODUCED ADDITIONAL DYNAMICS TO THE HYDROLOGIC SYSTEM. DELTAS FORM WHERE SEDIMENT IS DEPOSITED IN THE RESERVOIR, AND NATURAL VEGETATION HAS BEEN ELIMINATED BELOW HIGHWATER MARK.

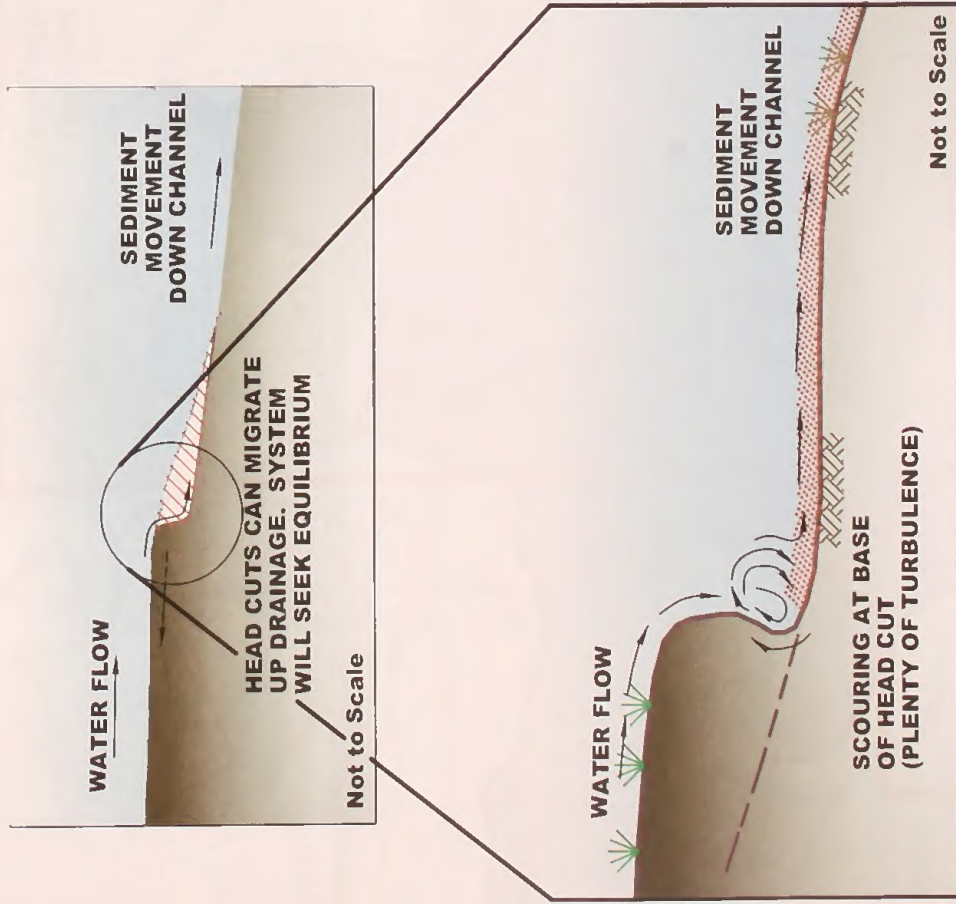


FLUCTUATING SEMINOE RESERVOIR LEVELS WILL EXASPERATE SCOURING AND DOWNCUTTING (BOTH HEAD AND SIDE CUTTING) BOTH ABOVE AND BELOW HIGH WATER MARK



DOWN-CUTTING THROUGH SEMINOE  
RESERVOIR DELTA SEDIMENTS BELOW  
HIGH WATER MARK



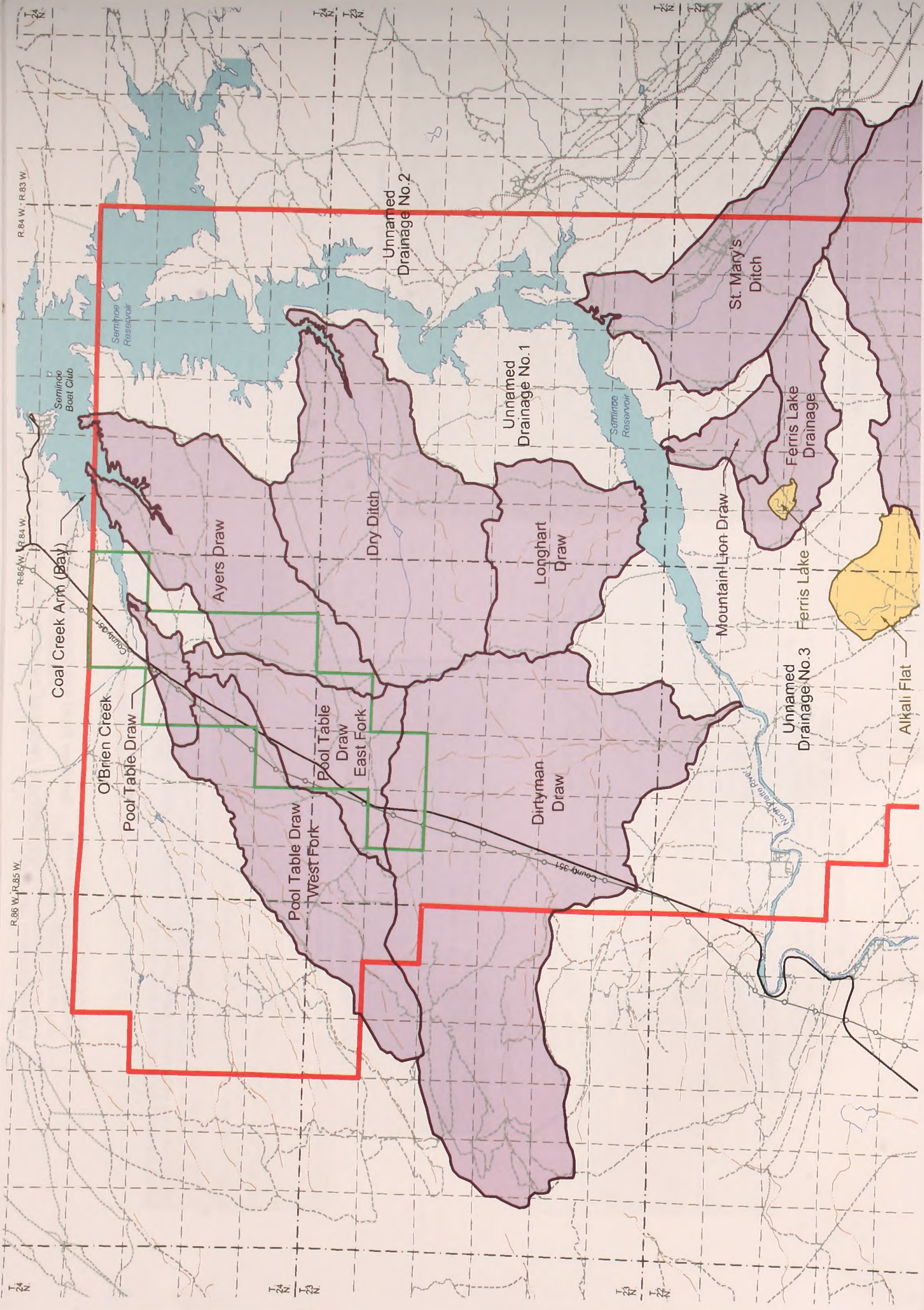


NATURAL DRAINAGE HEAD CUTTING

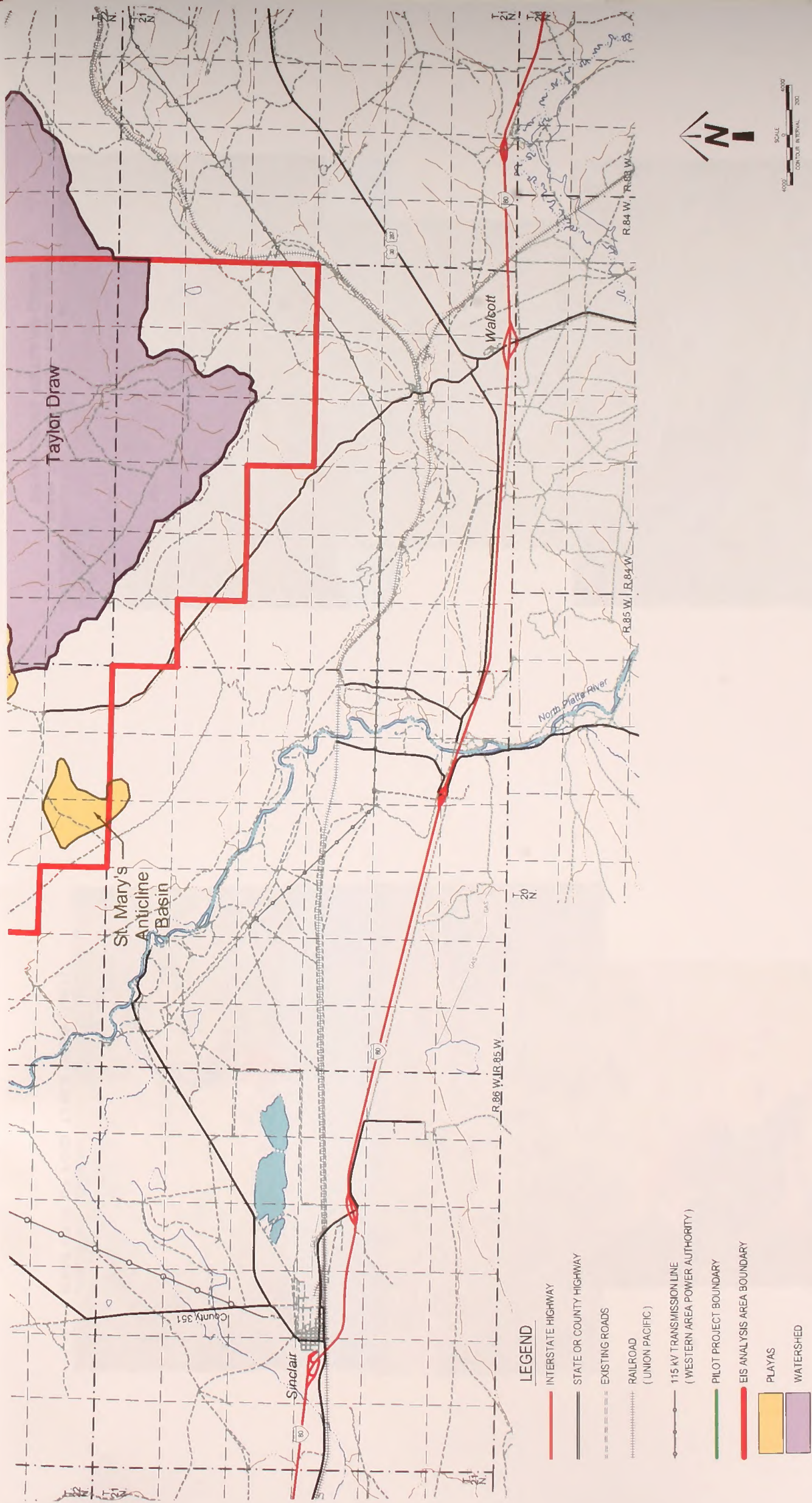
#### NOTES:

- 1) GEOMORPHIC CYCLE IS THE CYCLE OF EROSION.
- 2) GEOMORPHOLOGY IS THE SCIENCE THAT TREATS THE GENERAL CONFIGURATION OF THE EARTH'S SURFACE, SPECIFICALLY THE STUDY OF THE CLASSIFICATION, DESCRIPTION, NATURE, ORIGIN AND DEVELOPMENT OF PRESENT LANDFORMS.









Seminole Road Gas Development Project EIS  
**FIGURE 37**  
 WATERSHED MAP



**PRE-DISCHARGE**



**MOUTH OF POOL TABLE DRAW (2001)**



**MAIN FORK OF POOL TABLE DRAW (2001)**

**POST-DISCHARGE**



**MOUTH OF POOL TABLE DRAW (2003)**



**MAIN FORK OF POOL TABLE DRAW,  
DEVELOPING WETLAND (2002)**





**WEST FORK OF POOL TABLE DRAW  
BELOW DISCHARGE POINT 2 (2001)**

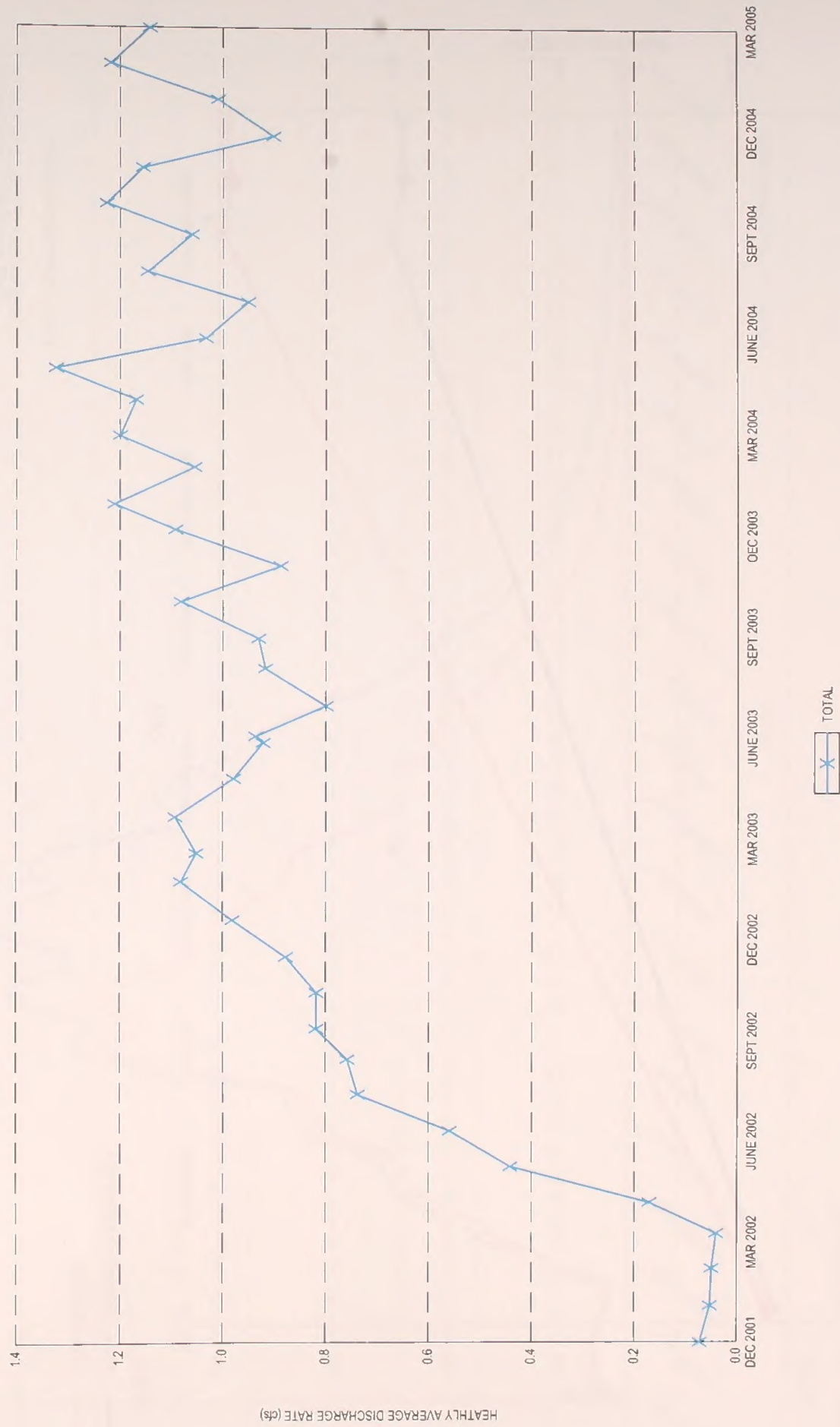


**WEST FORK OF POOL TABLE DRAW  
BELOW DISCHARGE POINT 2 (2002)**





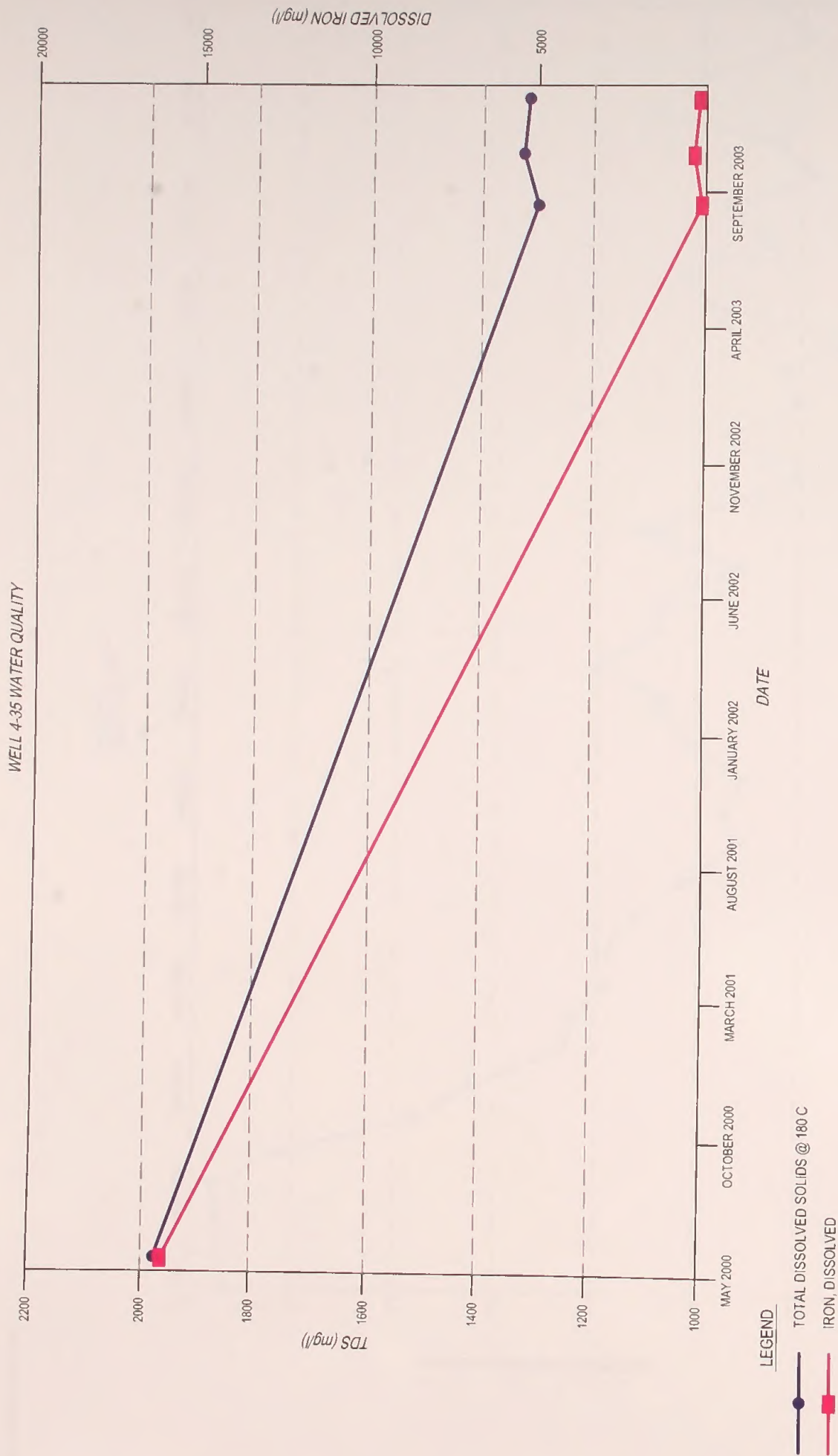




SOURCE: HDRO-GEO INC. 2005

Seminole Road Gas Development Project EIS  
 FIGURE 39  
 PILOT PROJECT DISCHARGE RATES



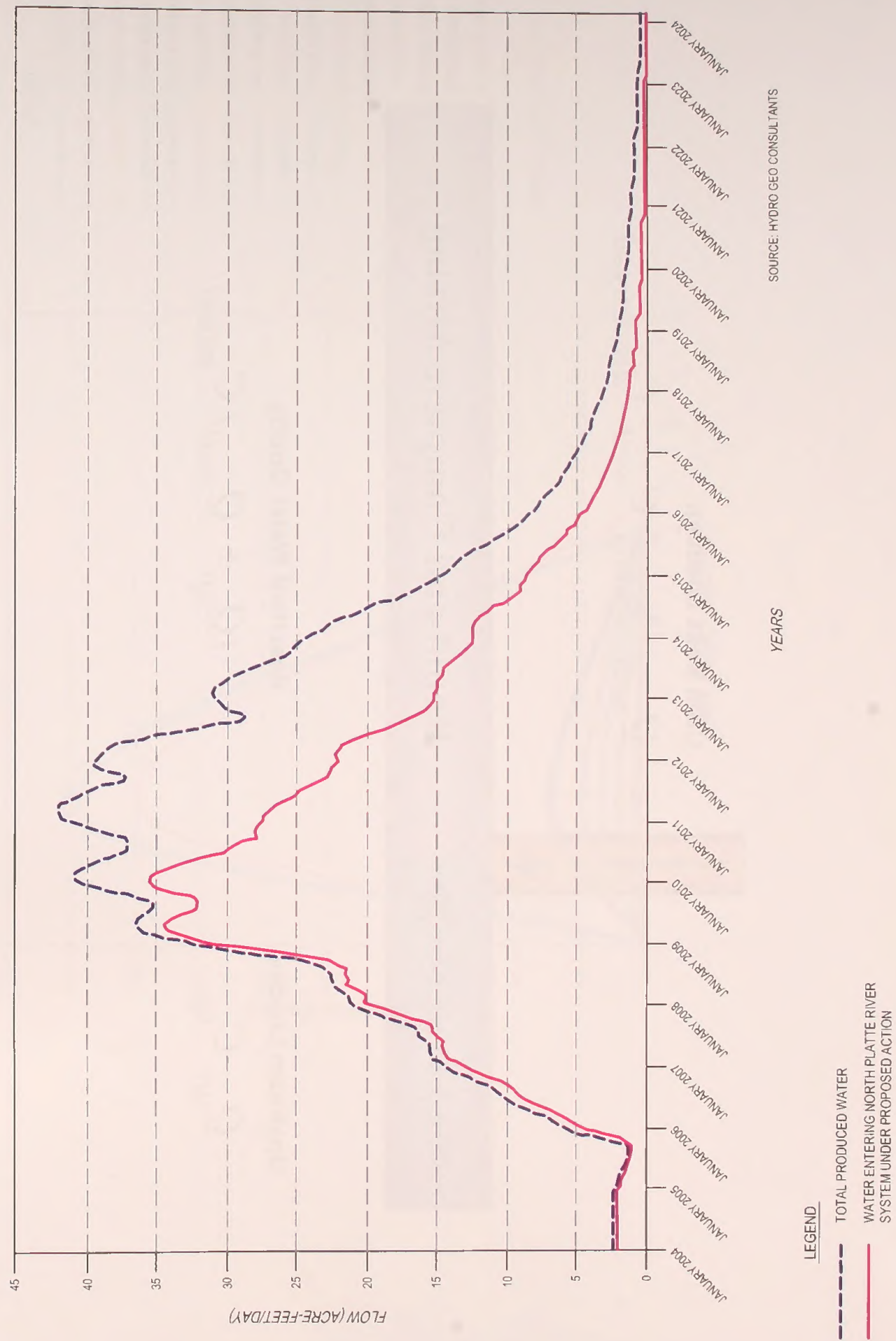


SOURCE: HYDRO GEO CONSULTANTS

NOTE: THE LOCATION OF WELL 4-35 IS SHOWN ON  
FIGURE 33: HYDROLOGIC MONITORING SITES  
LOCATION MAP.

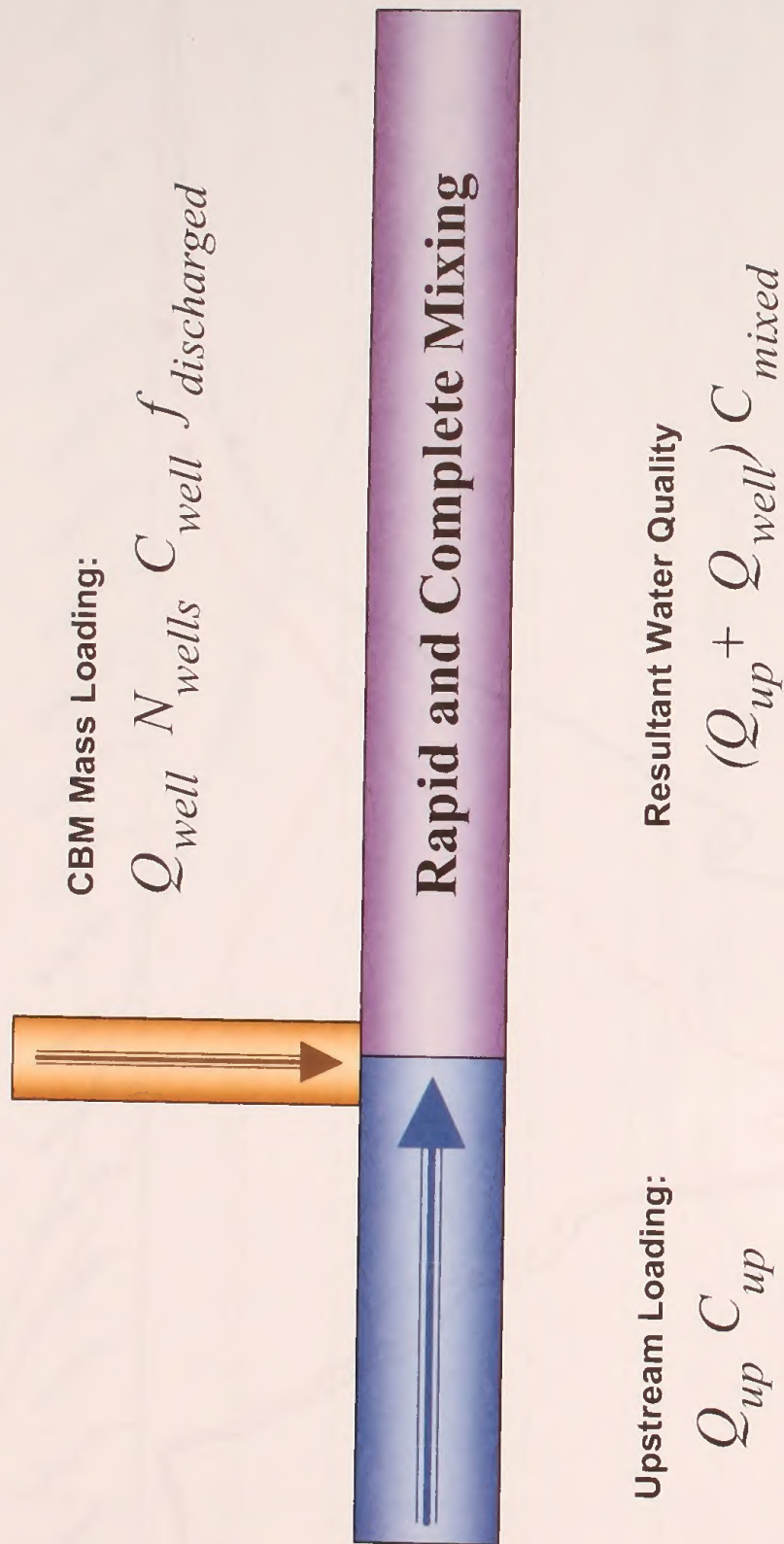
Seminole Road Gas Development Project EIS  
FIGURE 40  
PILOT PROJECT WATER QUALITY





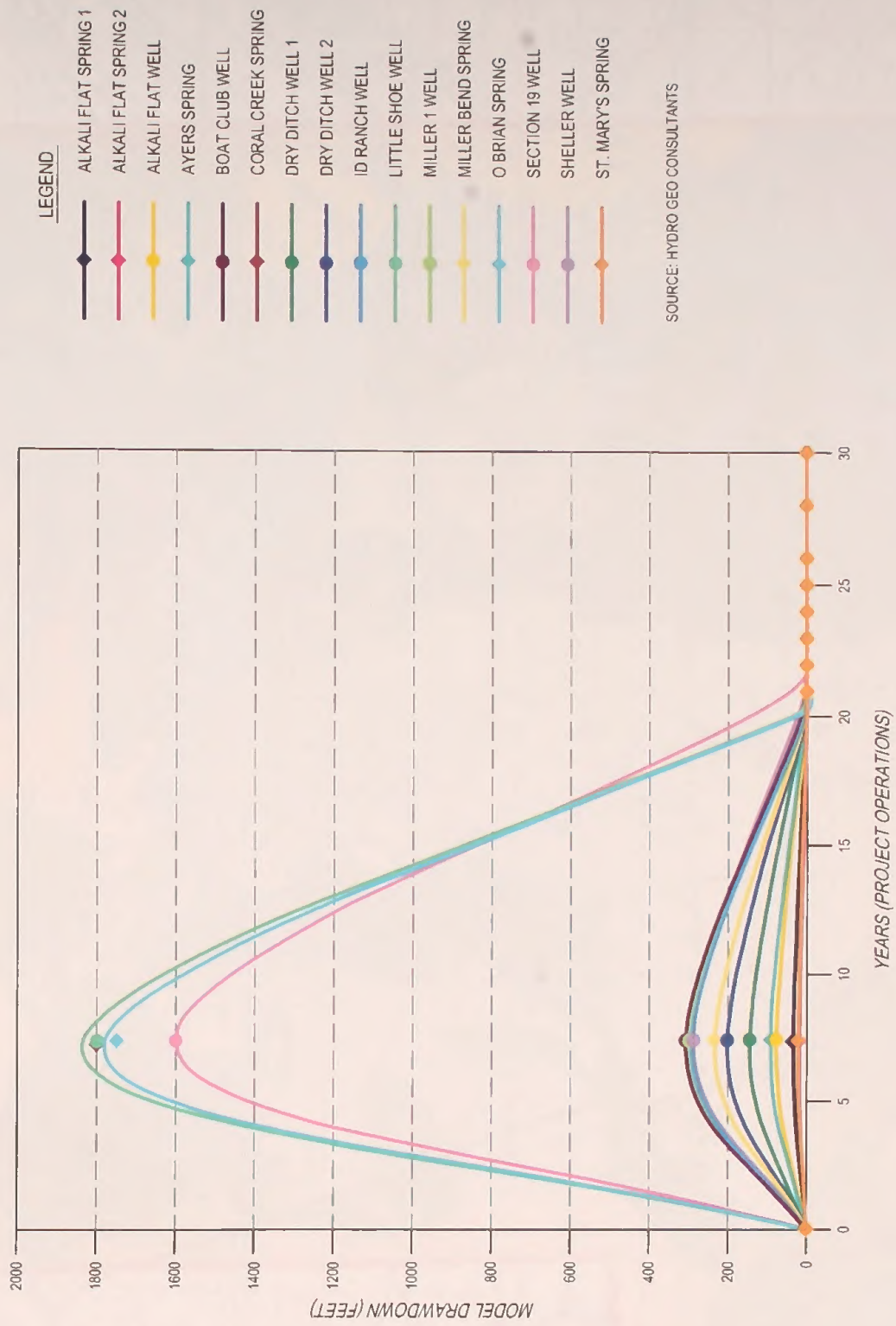
Seminole Road Gas Development Project EIS  
 FIGURE 41  
 PROJECT WATER PRODUCTION SCHEDULE





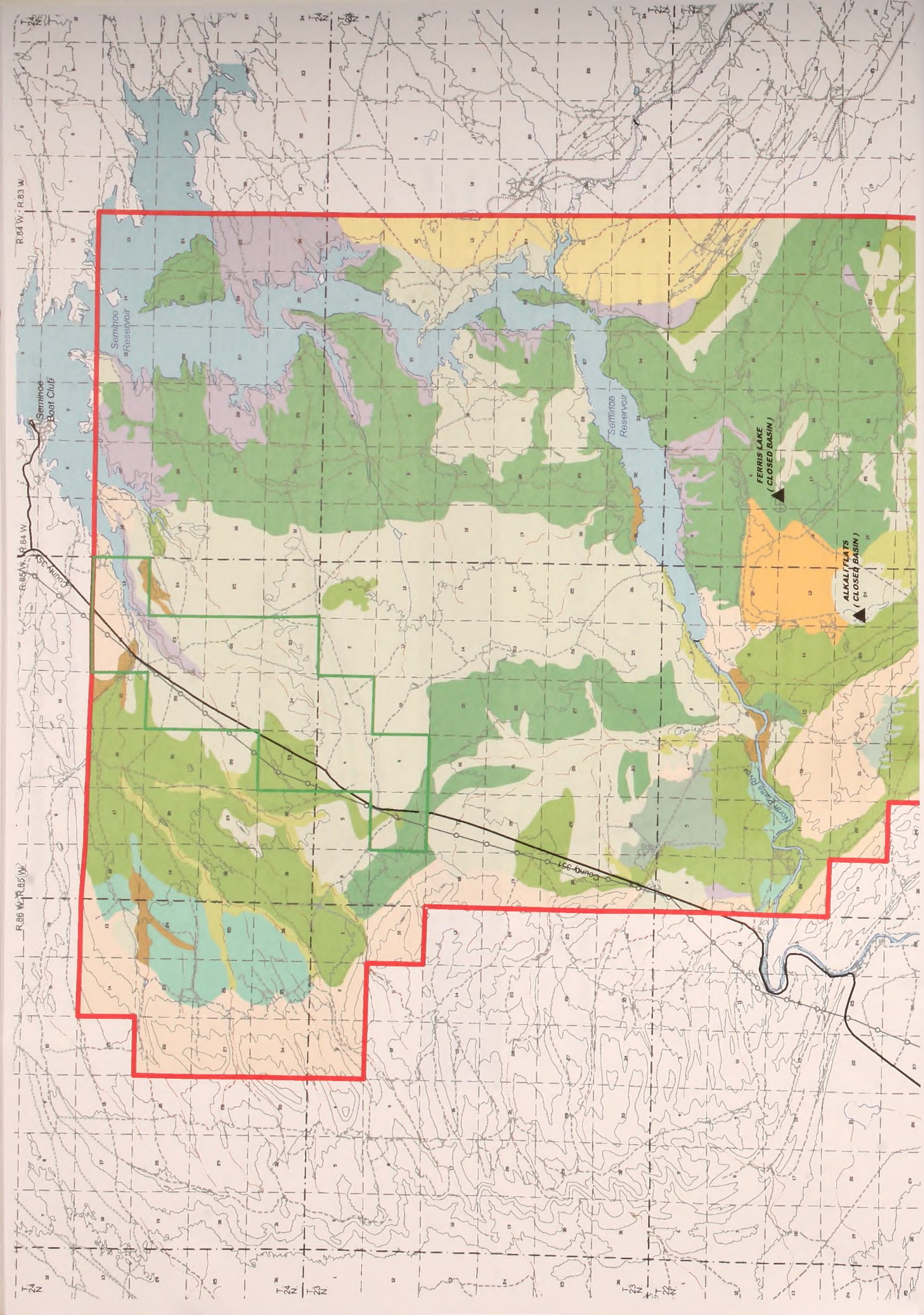
Seminole Road Gas Development Project EIS  
 FIGURE 42  
 DIAGRAM OF A SURFACE WATER MIXING MODEL



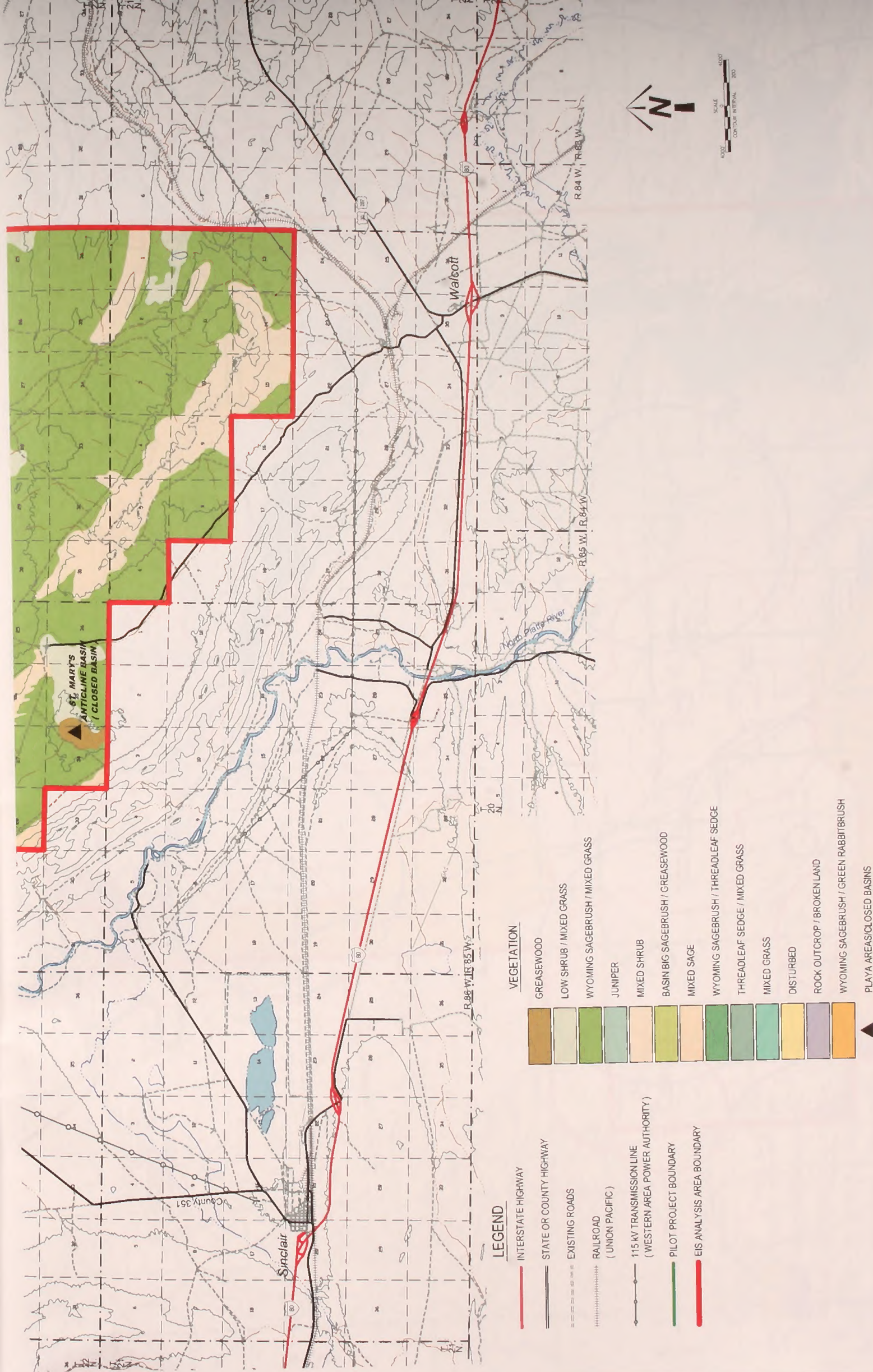


Seminole Road Gas Development Project EIS  
**FIGURE 43**  
**POTENTIAL GROUNDWATER DRAWDOWN AND RECOVERY (ALTERNATIVES B AND C)**





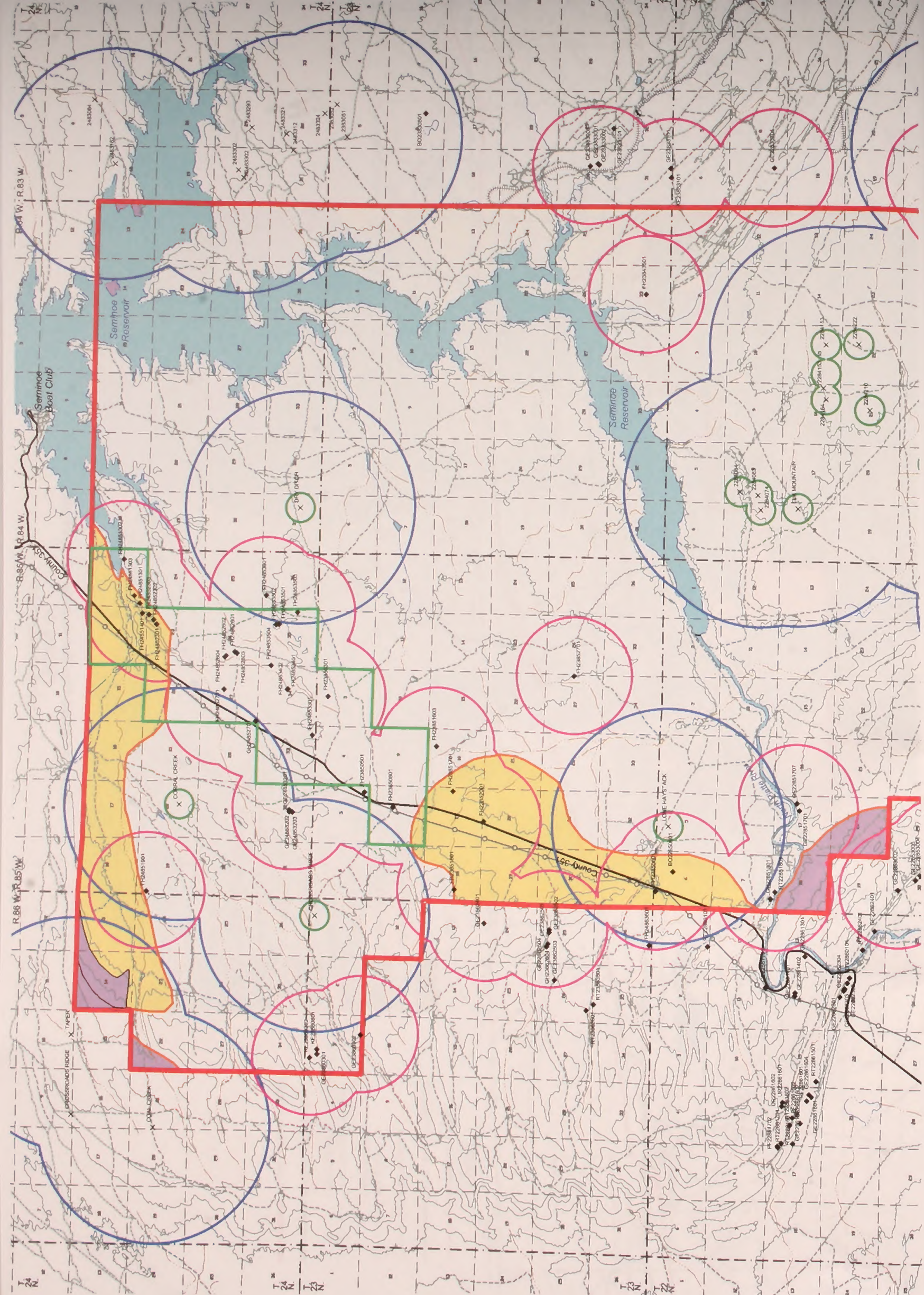




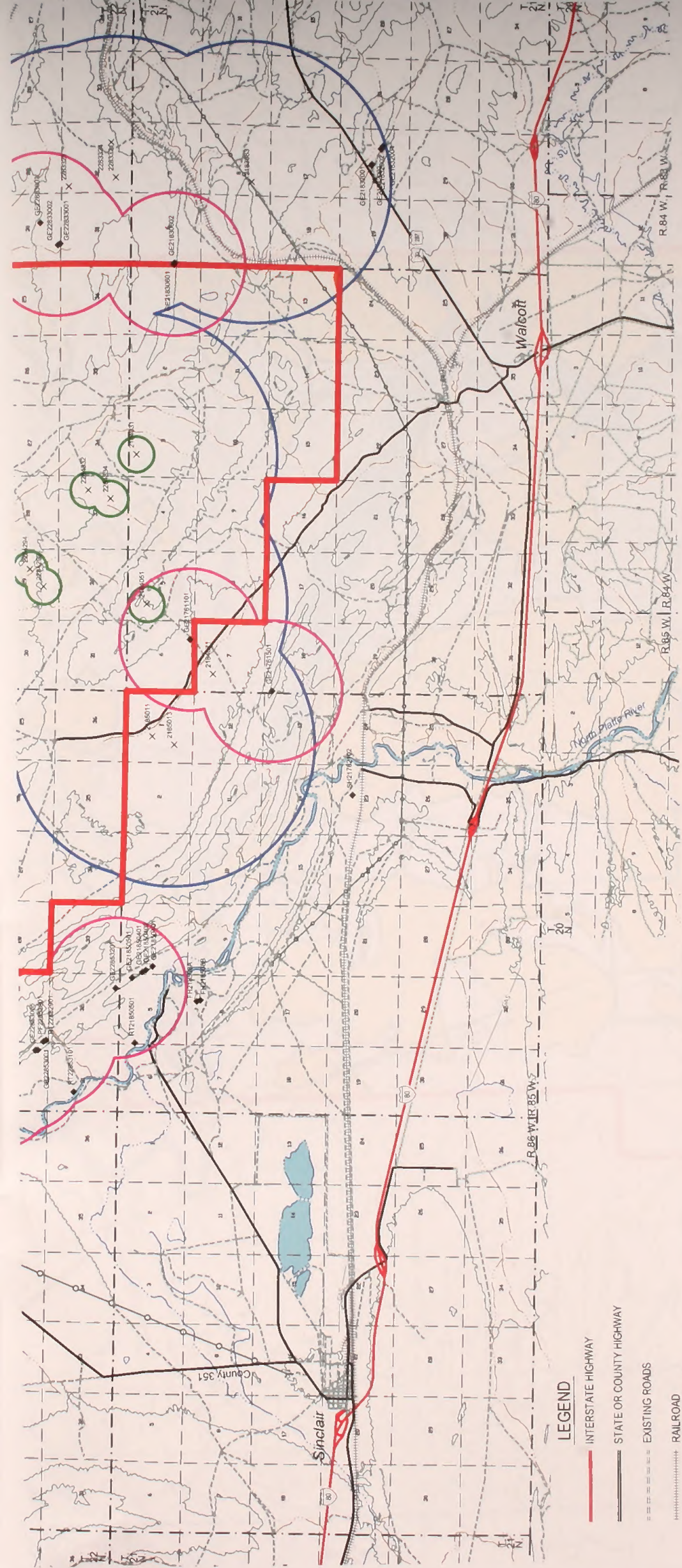
Seminole Road Gas Development Project EIS

FIGURE 44  
VEGETATION MAP



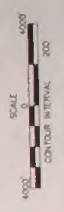
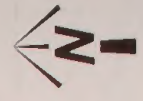






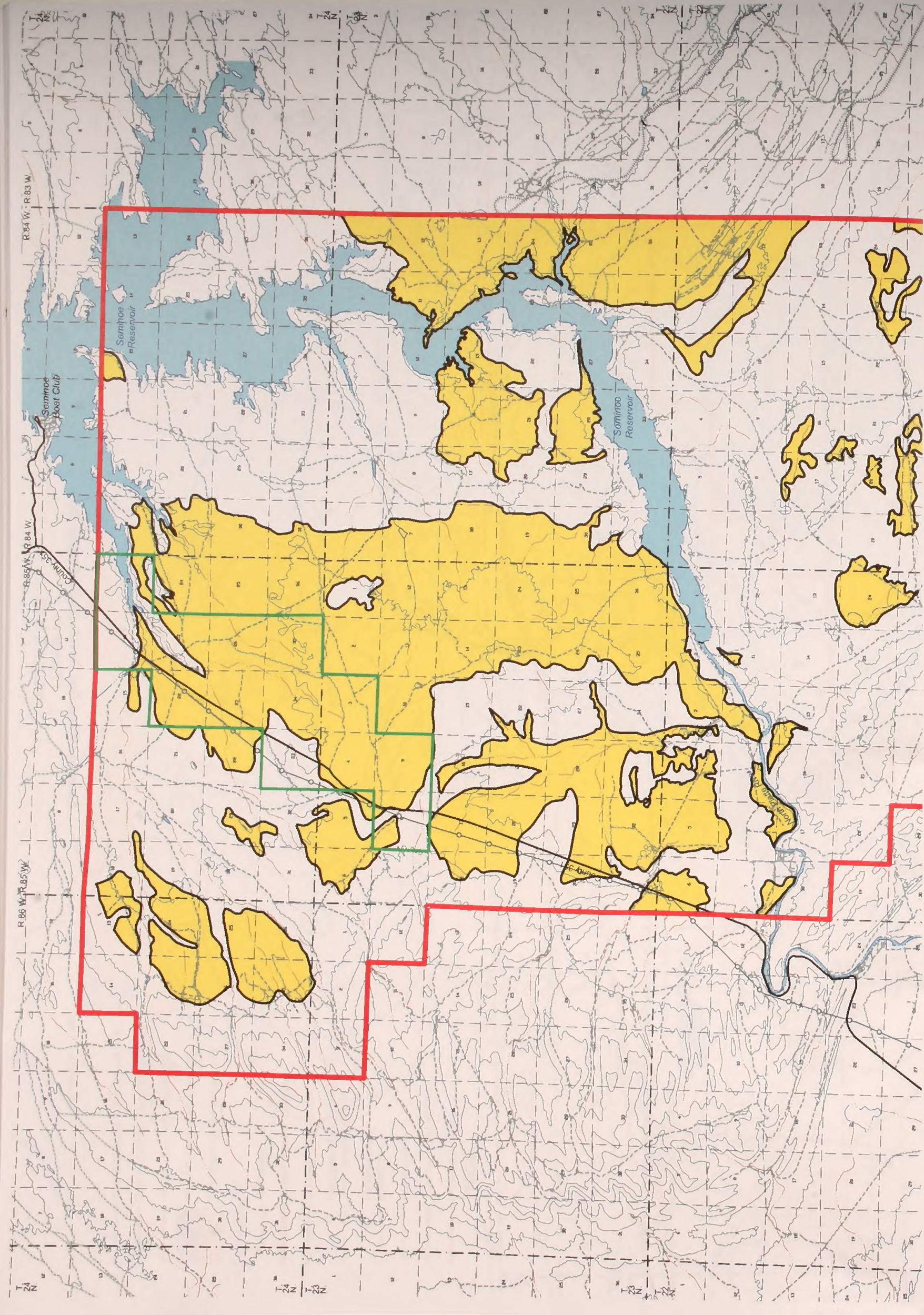
### LEGEND

- INTERSTATE HIGHWAY
- STATE OR COUNTY HIGHWAY
- EXISTING ROADS
- +++++ RAILROAD (UNION PACIFIC)
- 115 KV TRANSMISSION LINE (WESTERN AREA POWER AUTHORITY)
- PILOT PROJECT BOUNDARY
- EIS ANALYSIS AREA BOUNDARY
- ◆ PHQ3652701
- × LONE HAYSTACK
- ◆ RAPTOR NEST
- PRONGHORN CRUCIAL WINTER RANGE
- MULE DEER CRUCIAL WINTER RANGE
- RAPTOR NEST 1.0 MILE BUFFER ZONE
- SAGE GROUSE LEK - 0.25 MILE BUFFER ZONE
- SAGE GROUSE LEK - 2.0 MILE BUFFER ZONE

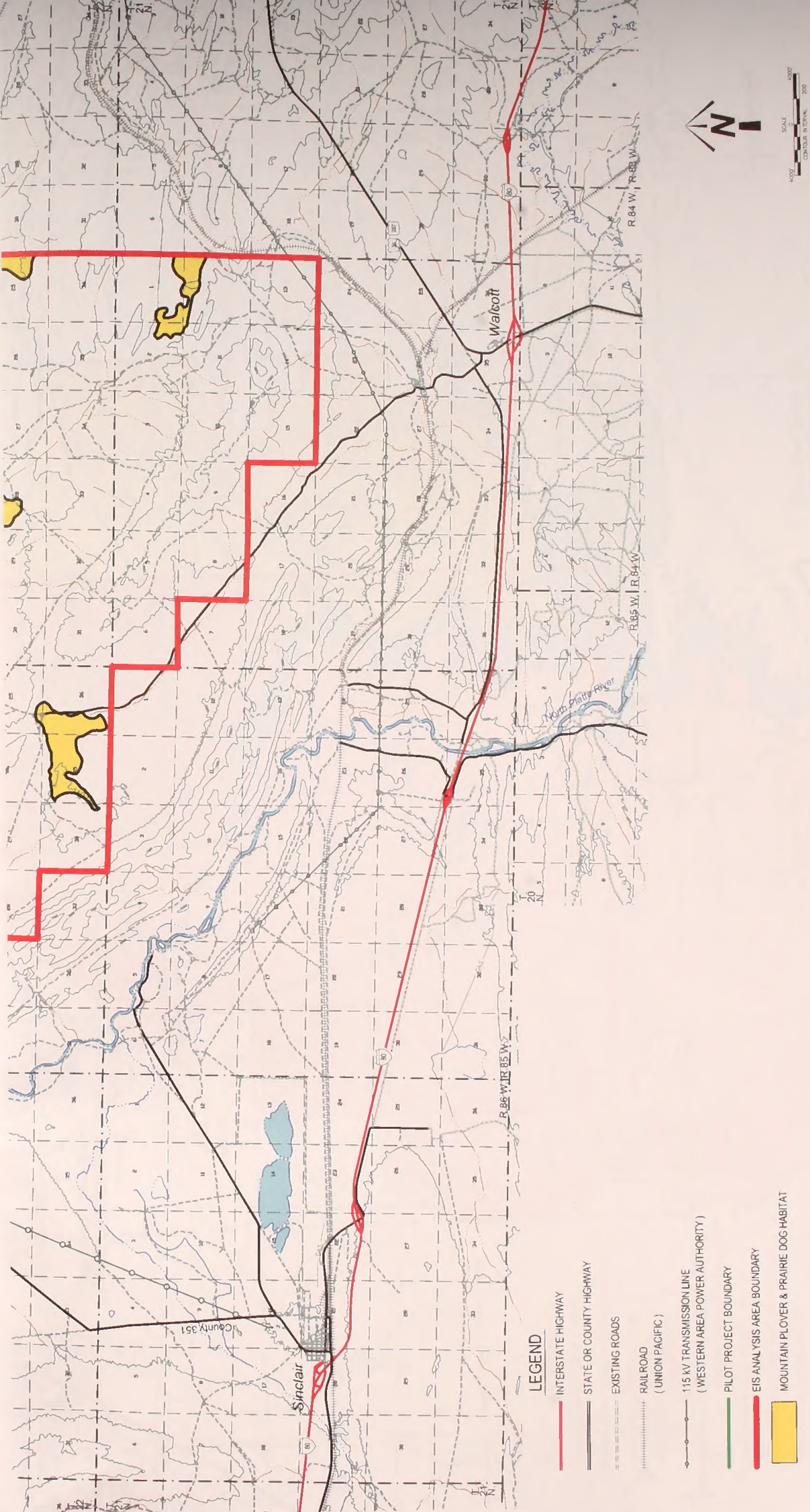


Seminole Road Gas Development Project EIS  
**FIGURE 45**  
 WILDLIFE MAP



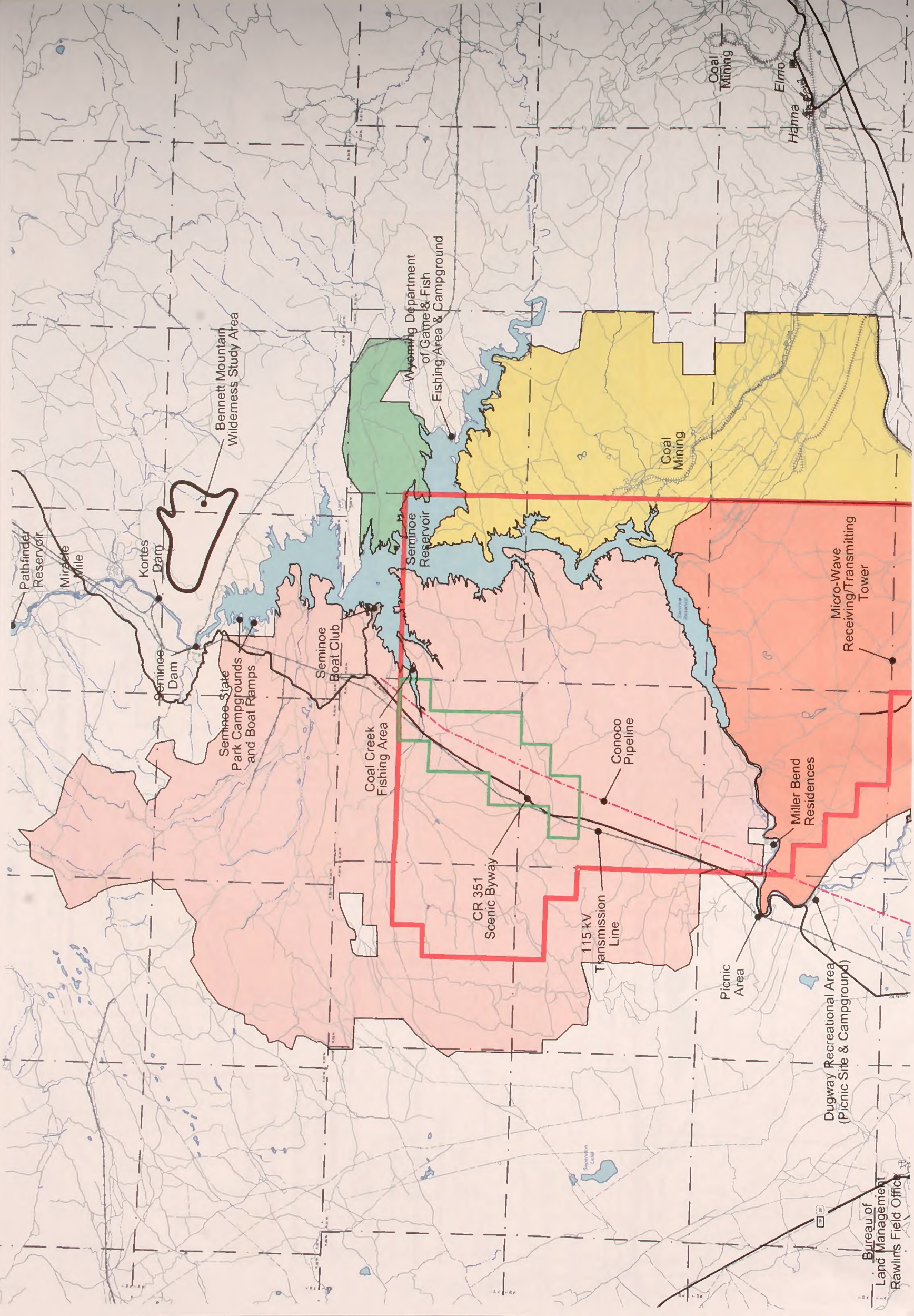






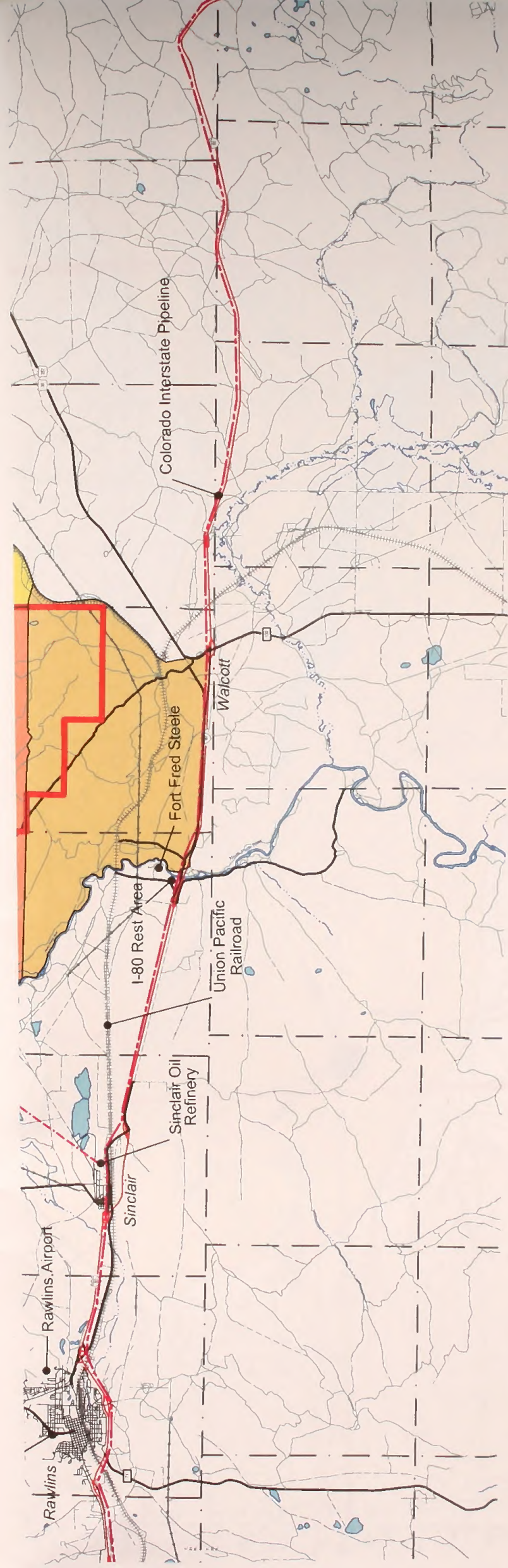
Seminole Road Gas Development Project EIS  
 FIGURE 46  
 MOUNTAIN PLOVER & PRAIRIE DOG HABITAT



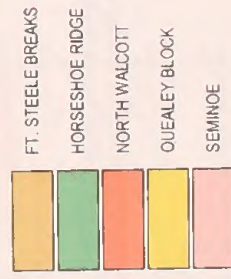


Bureau of  
Land Management  
Rawlins Field Office

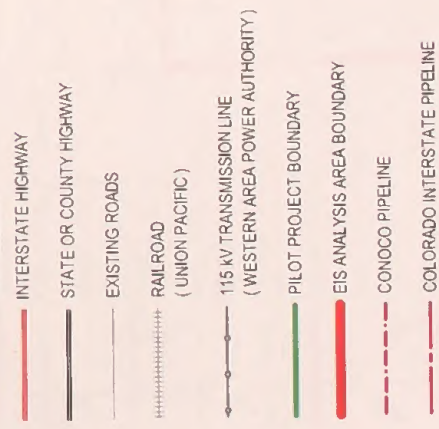




# **BUREAU OF LAND MANAGEMENT GRAZING ALLOTMENTS**

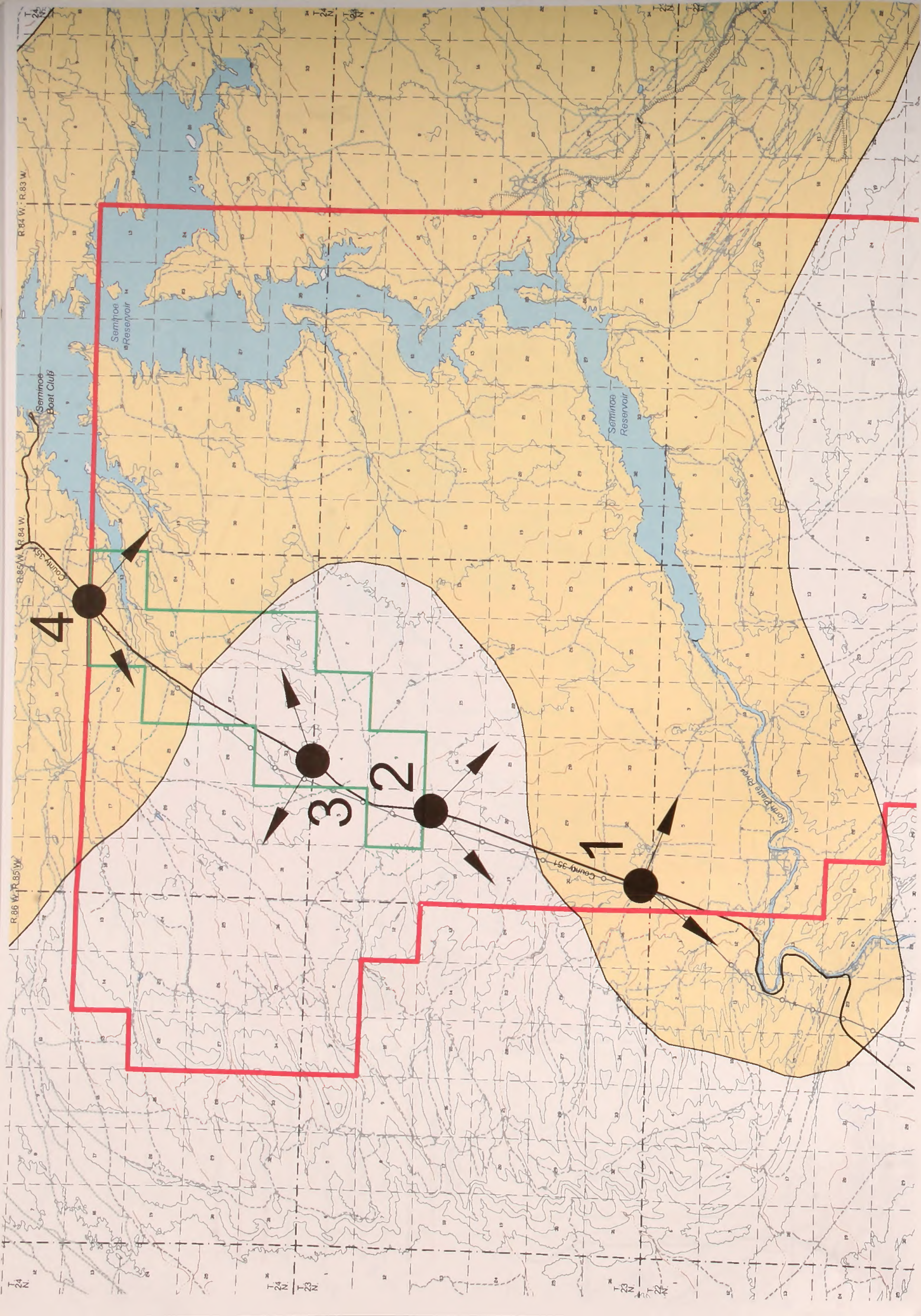


## **LEGEND**

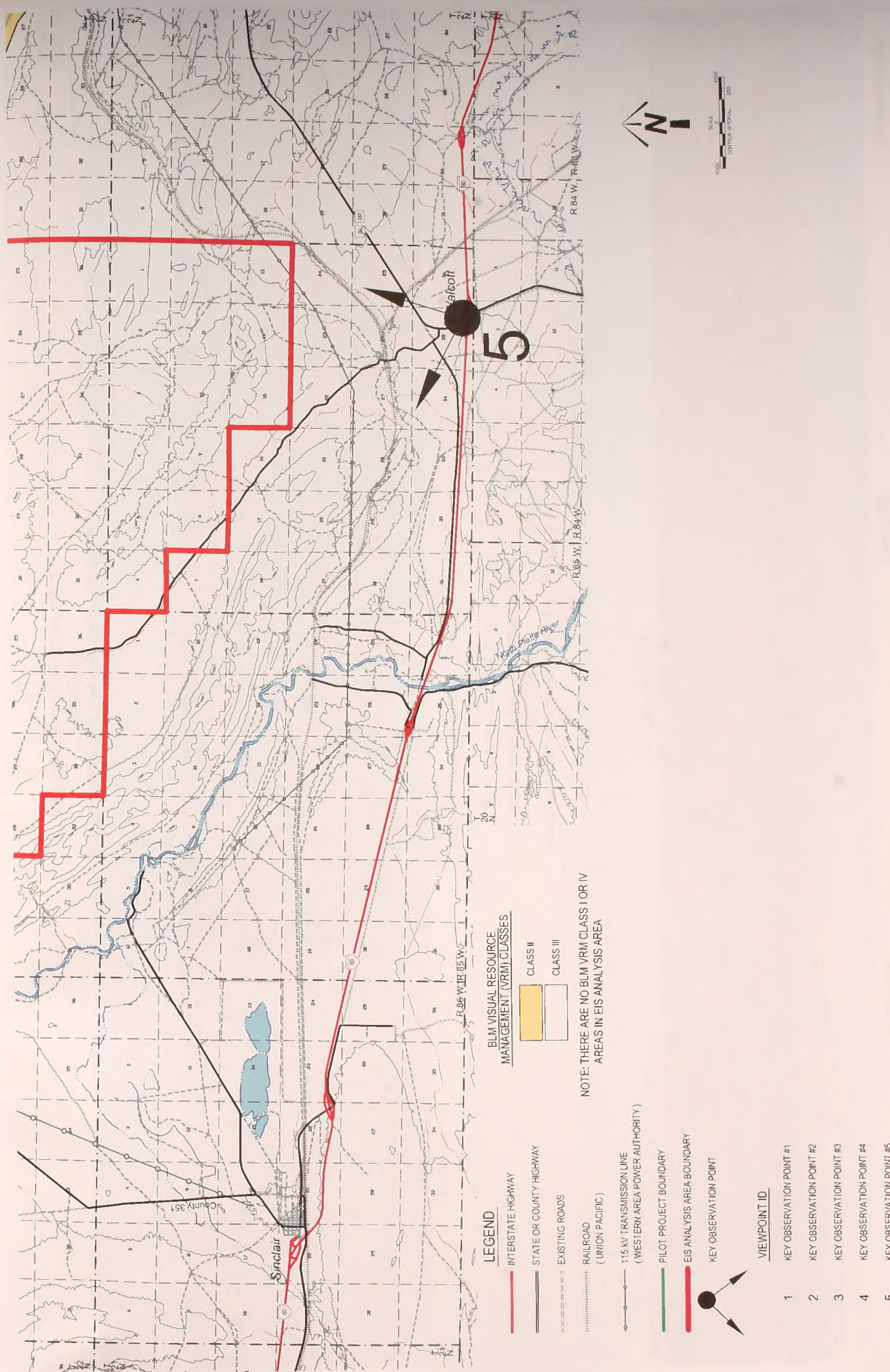


**Seminole Road Gas Development Project EIS**  
**FIGURE 47**  
**BLM GRAZING ALLOTMENTS**









Seminole Road Gas Development Project EIS

FIGURE 48

VISUAL RESOURCE MANAGEMENT



ELK MOUNTAIN

CEDAR RIDGE

115 KV WAPA  
TRANSMISSION LINES



NOTE: SEE FIGURE 48, VISUAL RESOURCE MANAGEMENT FOR  
LOCATION OF THIS KEY OBSERVATION POINT.

LOOKING SOUTH

SEMINOE ROAD  
(COUNTY ROAD 351)

Seminole Road Gas Development Project EIS  
FIGURE 49  
KEY OBSERVATION POINT No. 1

ELK MOUNTAIN

MILLER NO1 WELL

CEDAR RIDGE



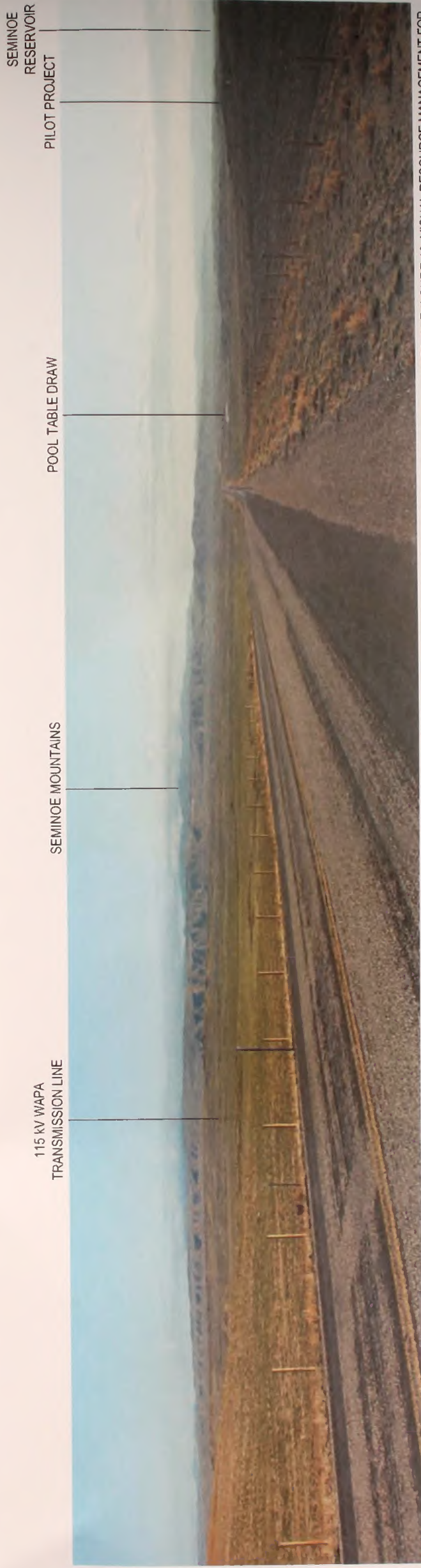
NOTE: SEE FIGURE 48, VISUAL RESOURCE MANAGEMENT FOR  
LOCATION OF THIS KEY OBSERVATION POINT.

LOOKING SOUTH

SEMINOE ROAD  
(COUNTY ROAD 351)

Seminole Road Gas Development Project EIS  
FIGURE 50  
KEY OBSERVATION POINT No. 2



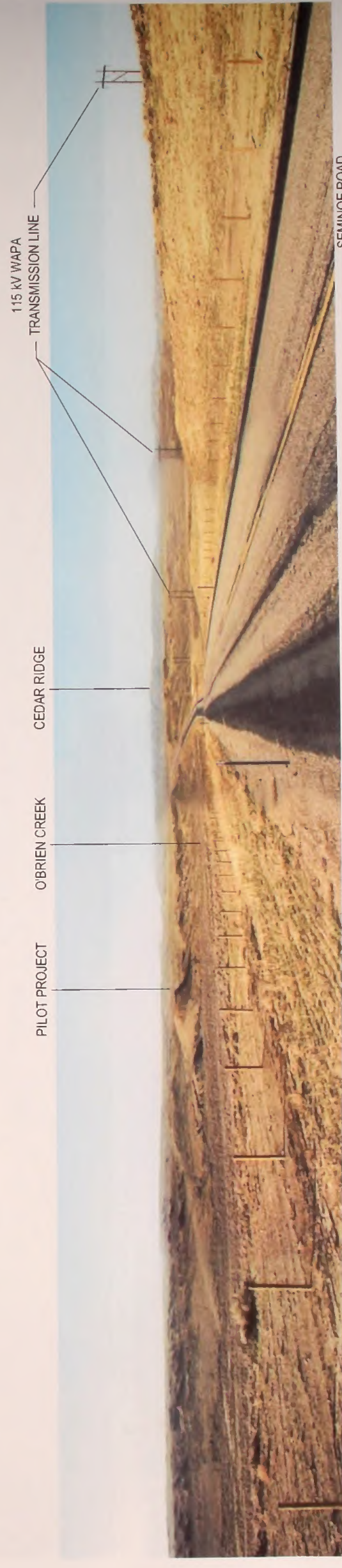


SEMINOE ROAD  
(COUNTY ROAD 351)

LOOKING NORTH

Seminole Road Gas Development Project EIS  
FIGURE 51  
KEY OBSERVATION POINT No. 3

NOTE: SEE FIGURE 48, VISUAL RESOURCE MANAGEMENT FOR  
LOCATION OF THIS KEY OBSERVATION POINT.



NOTE: SEE FIGURE 48, VISUAL RESOURCE MANAGEMENT FOR  
LOCATION OF THIS KEY OBSERVATION POINT.

LOOKING SOUTH

Seminole Road Gas Development Project EIS  
FIGURE 52  
KEY OBSERVATION POINT No. 4







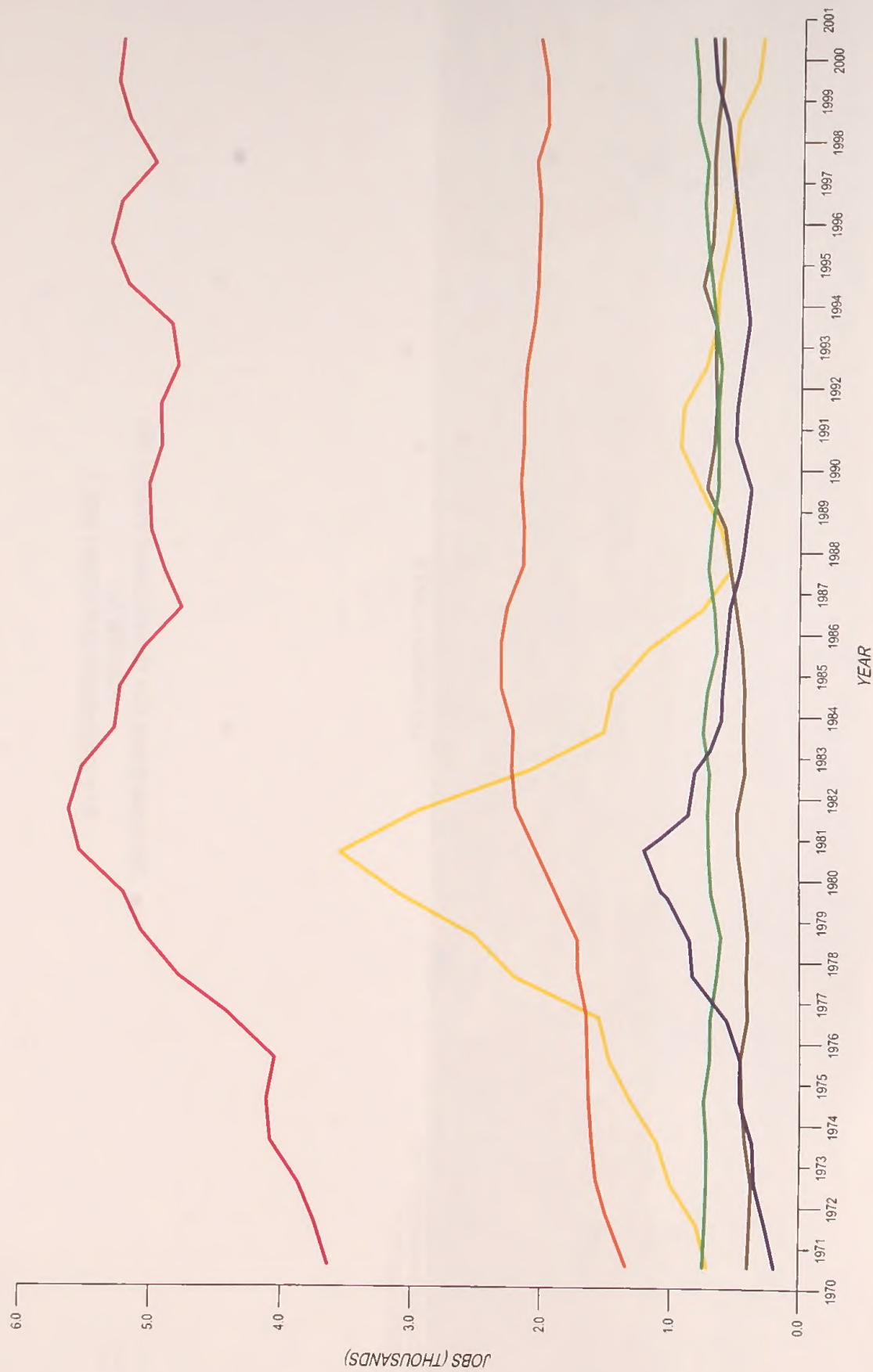


LOOKING NORTH

NOTE: SEE FIGURE 48, VISUAL RESOURCE MANAGEMENT FOR  
LOCATION OF THIS KEY OBSERVATION POINT.

Seminole Road Gas Development Project EIS  
FIGURE 53  
KEY OBSERVATION POINT NO. 5





#### LEGEND

— SERVICE & PROFESSIONAL

— GOVERNMENT

— FARM & AGRICULTURAL SERVICES

— MANUFACTURING ( INCLUDES FOREST PRODUCTS)

— MINING

SOURCE: WYOMING DEPARTMENT OF ADMINISTRATION & INFORMATION,  
ECONOMIC ANALYSIS DIVISION

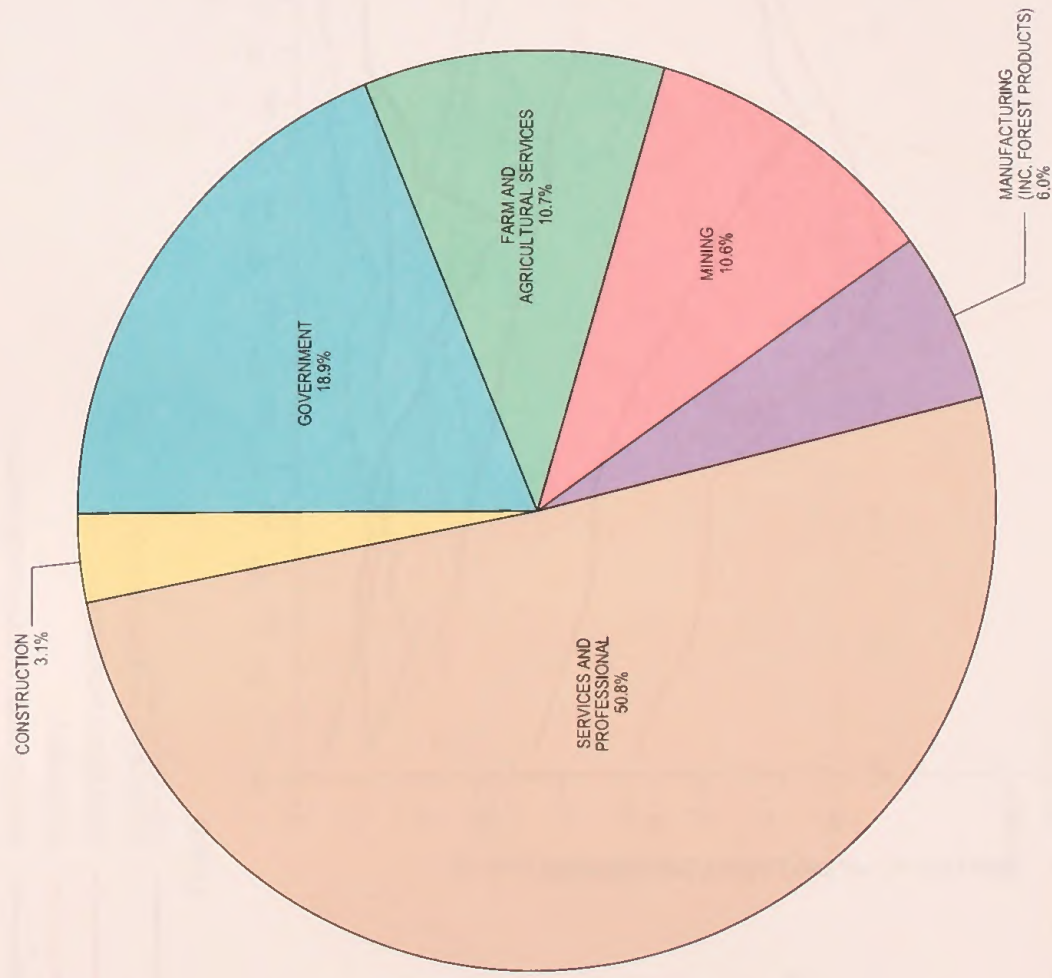
Seminole Road Gas Development Project EIS

FIGURE 54

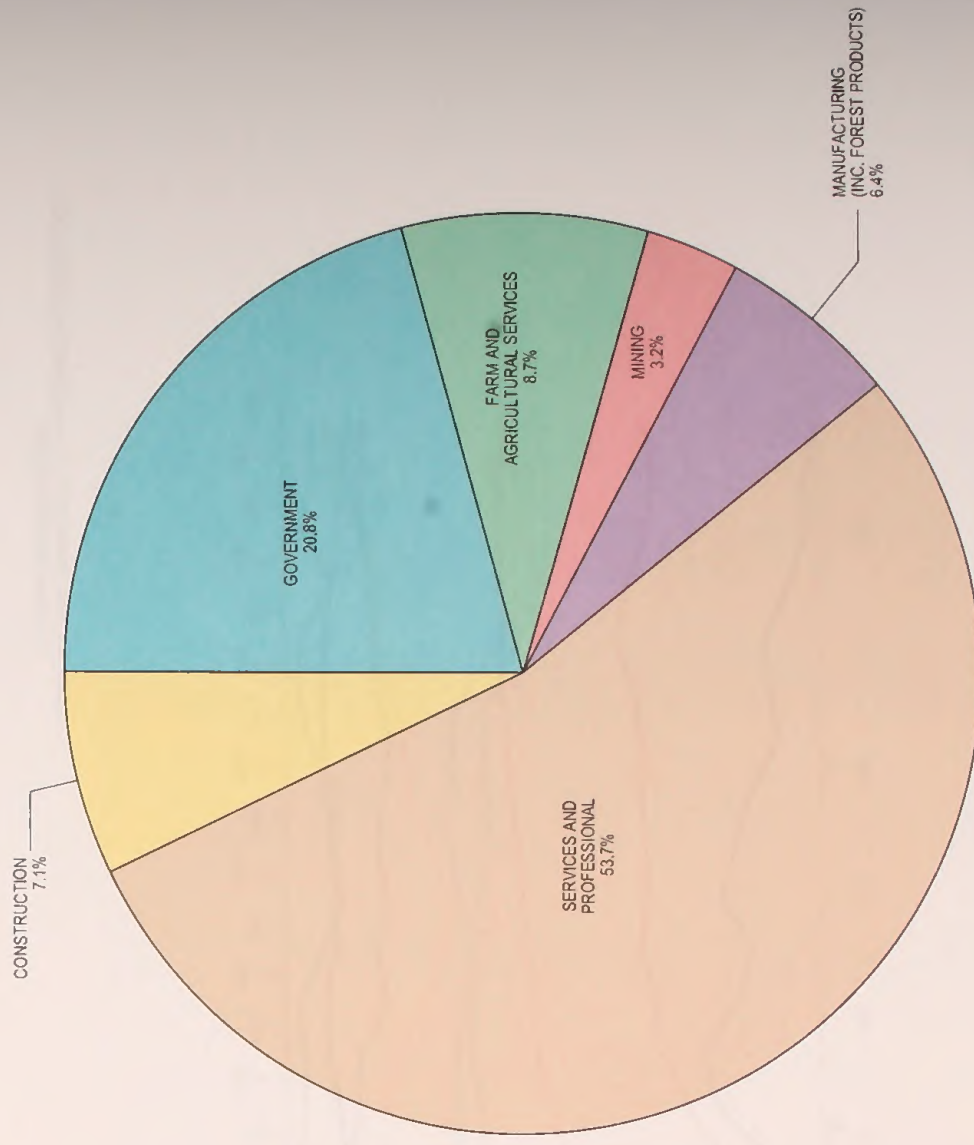
CARBON COUNTY EMPLOYMENT BY INDUSTRY (1970 - 2000)



1970



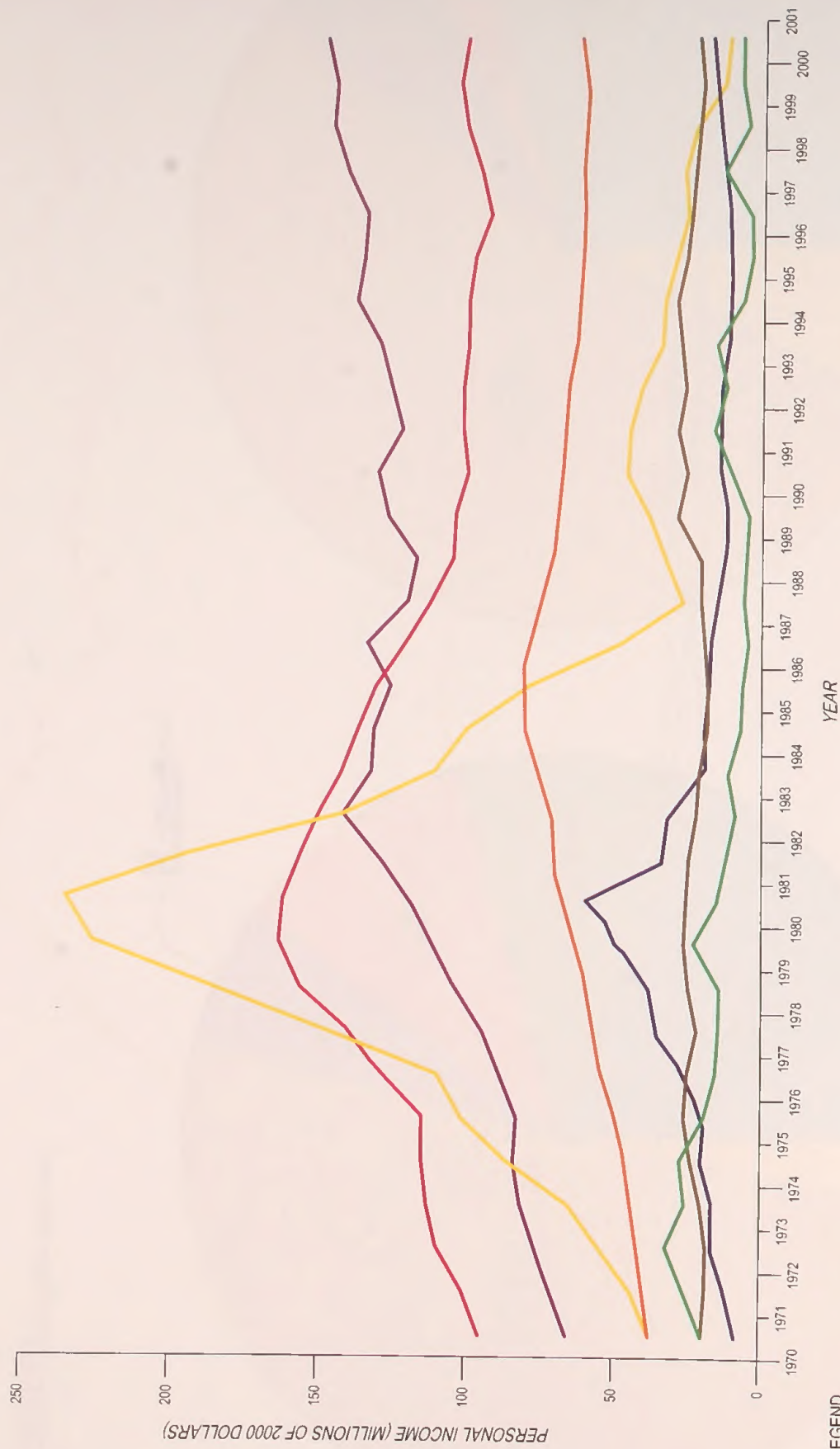
2000



SOURCE: WYOMING DEPARTMENT OF ADMINISTRATION & INFORMATION,  
ECONOMIC ANALYSIS DIVISION

Seminole Road Gas Development Project EIS  
FIGURE 55  
CARBON COUNTY JOBS - 1970 AND 2000

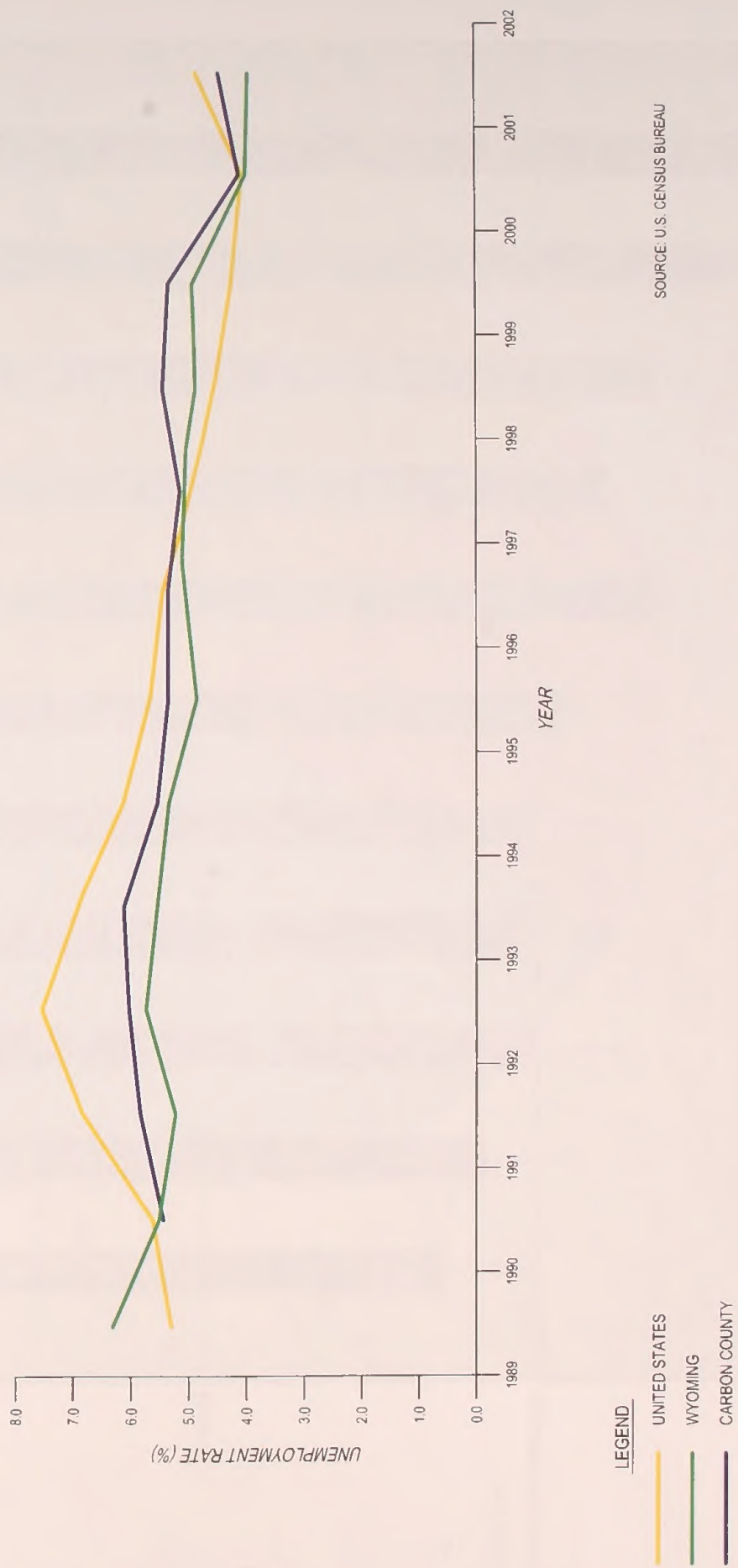




SOURCE: WYOMING DEPARTMENT OF ADMINISTRATION & INFORMATION,  
ECONOMIC ANALYSIS DIVISION

Seminole Road Gas Development Project EIS  
FIGURE 56  
CARBON COUNTY PERSONAL INCOME (1970 - 2000)

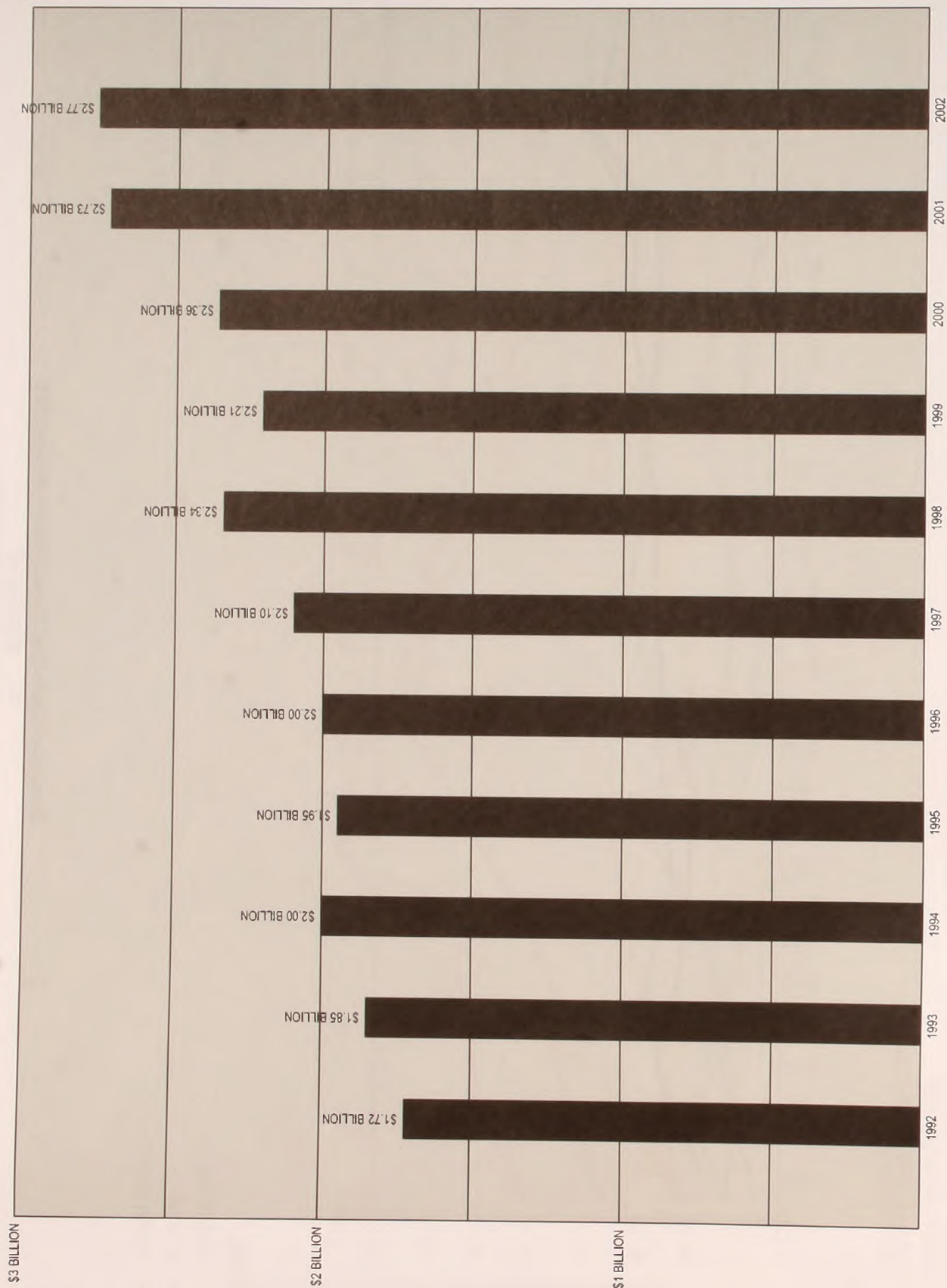




Seminole Road Gas Development Project EIS

FIGURE 57  
UNEMPLOYMENT RATES

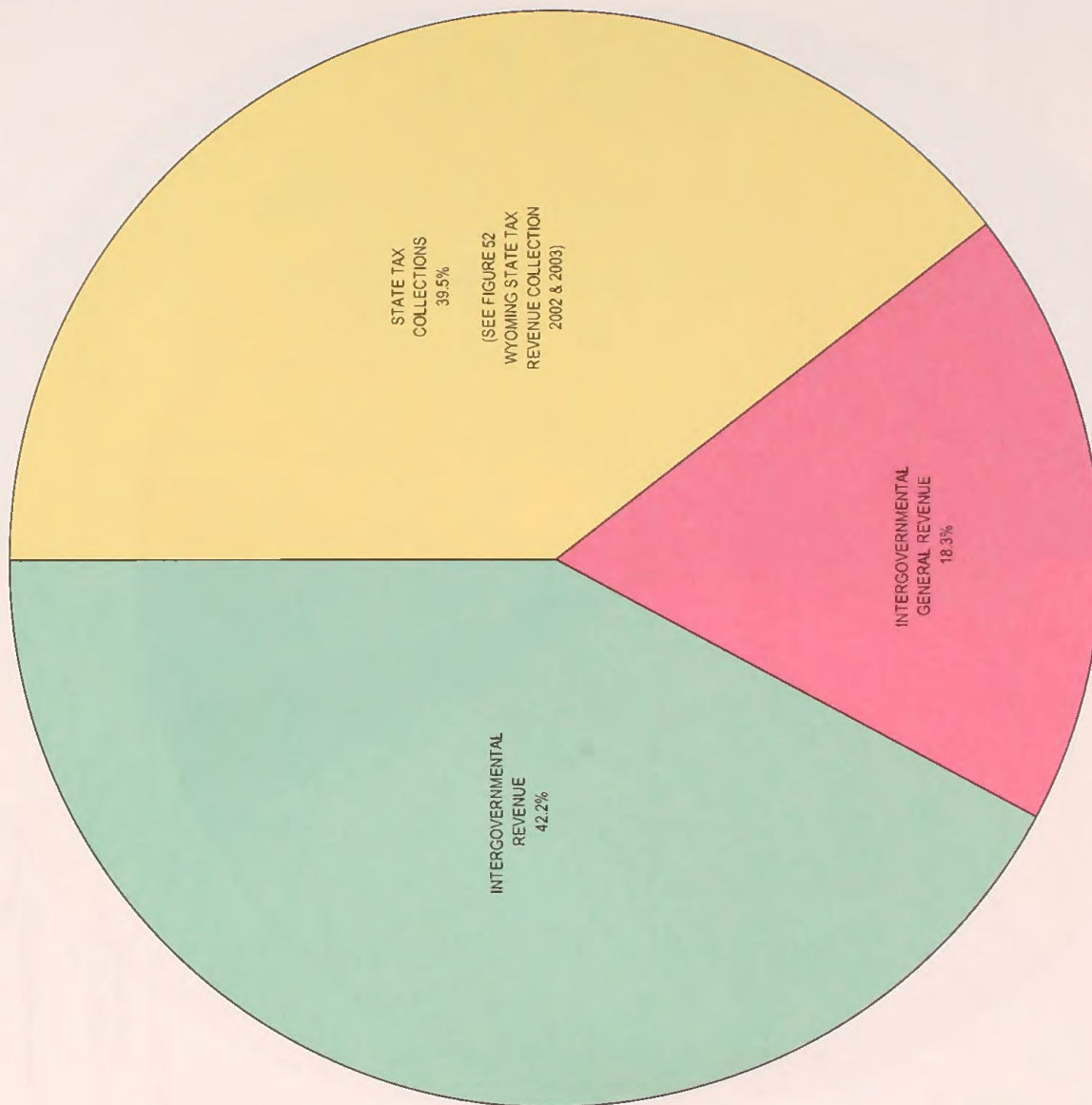




SOURCE: U.S. CENSUS BUREAU

Seminole Road Gas Development Project EIS  
 FIGURE 58  
 WYOMING STATE GENERAL REVENUES - 1992-2002



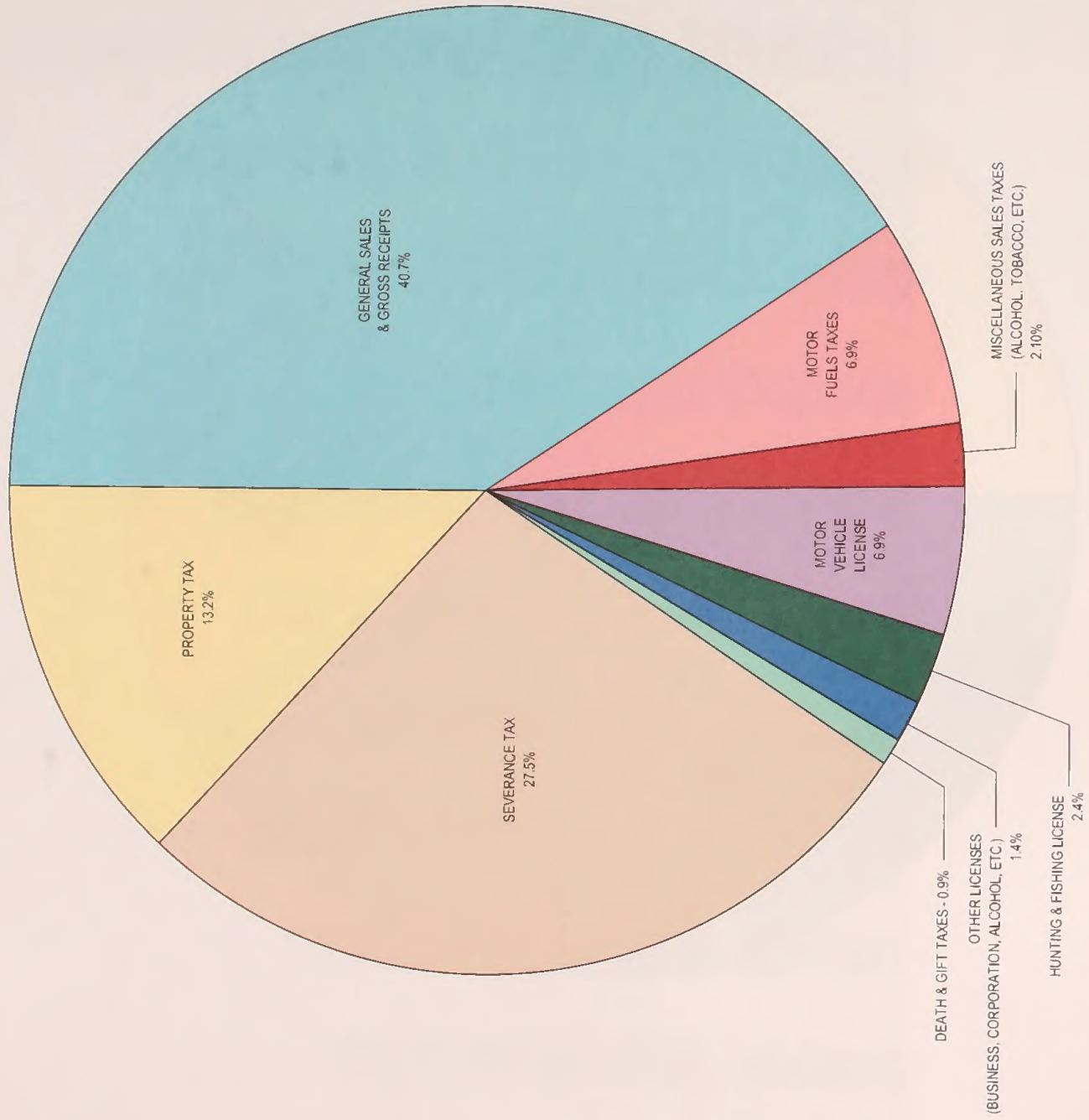


\* \$2,768,326,000 IN 2002  
SOURCE: U.S. CENSUS BUREAU

Seminole Road Gas Development Project EIS  
FIGURE 59  
WYOMING GENERAL REVENUE SOURCE \*



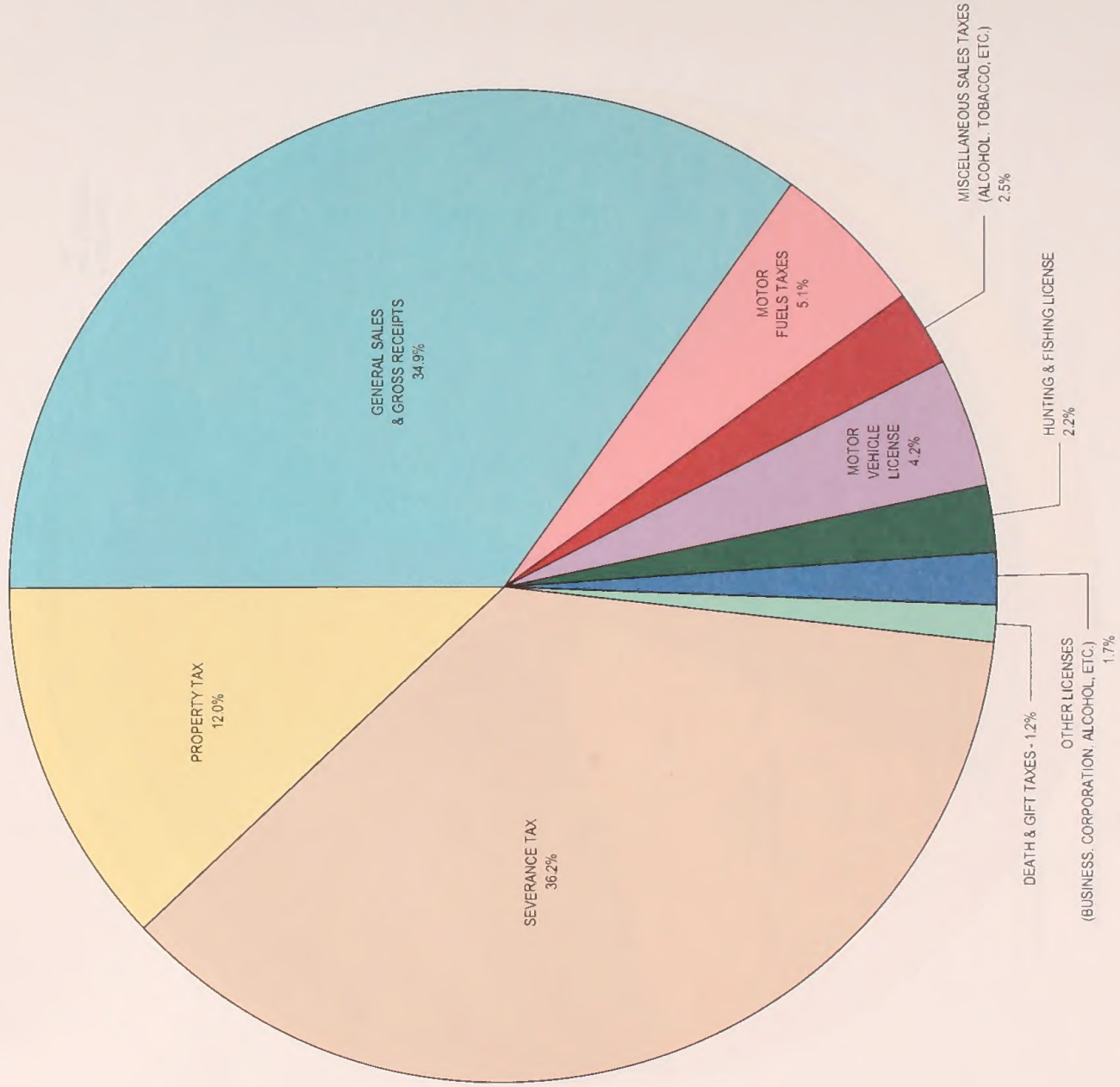
2002\*



\* \$1,094,402,000 IN 2002; APPROXIMATELY \$2,193.19 PER CAPITA BASED ON POPULATION OF 499,000 PERSONS



2003\*\*



SOURCE: U.S. CENSUS BUREAU

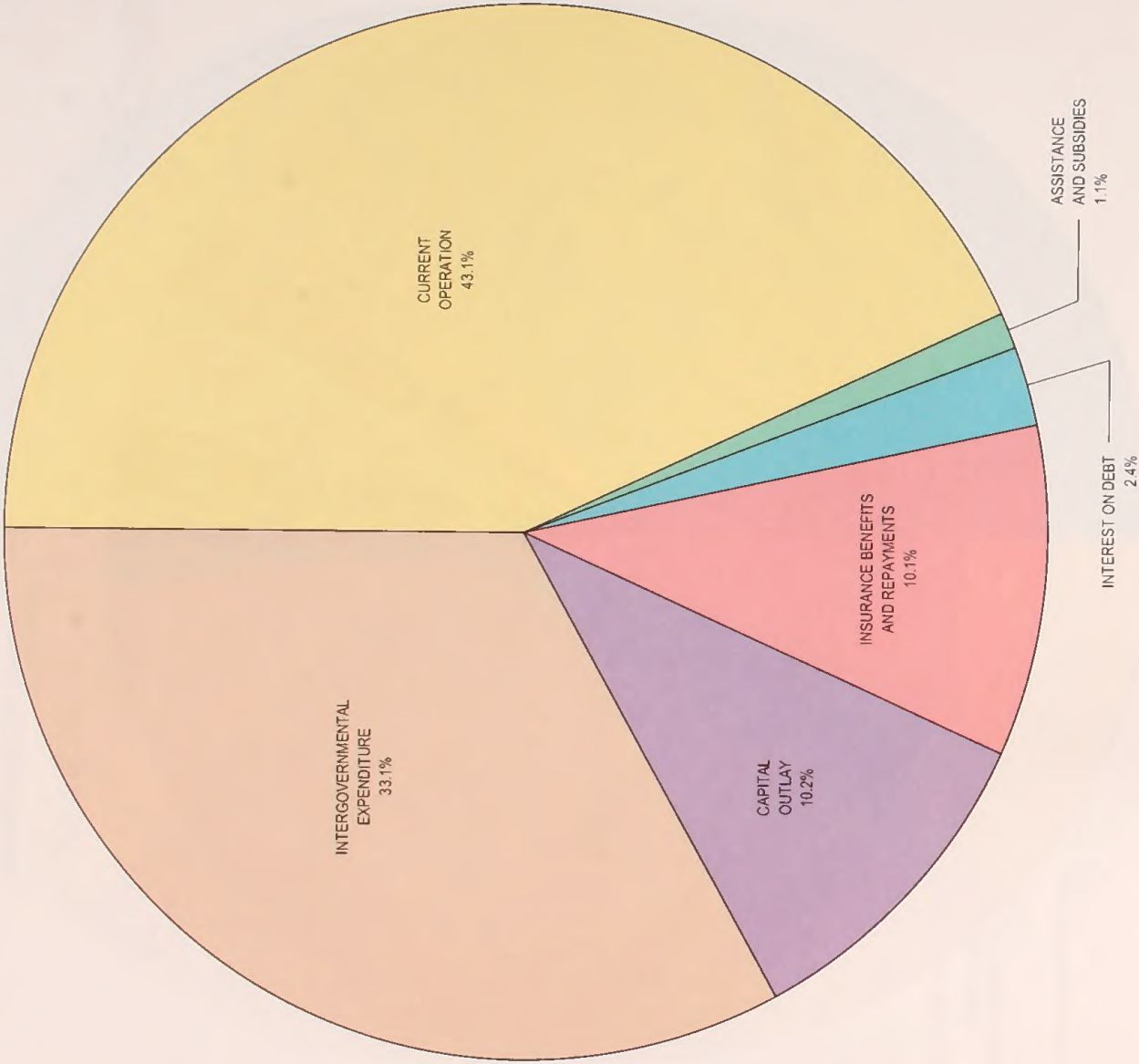
NOTE: NO INCOME TAXES IN WYOMING

\*\* \$1,217,154,000 IN 2003; APPROXIMATELY \$2,429.45 PER CAPITA BASED ON POPULATION OF 501,000 PERSONS

**Seminole Road Gas Development Project EIS**  
**FIGURE 60**  
**WYOMING STATE TAX REVENUE COLLECTION - 2002 & 2003**

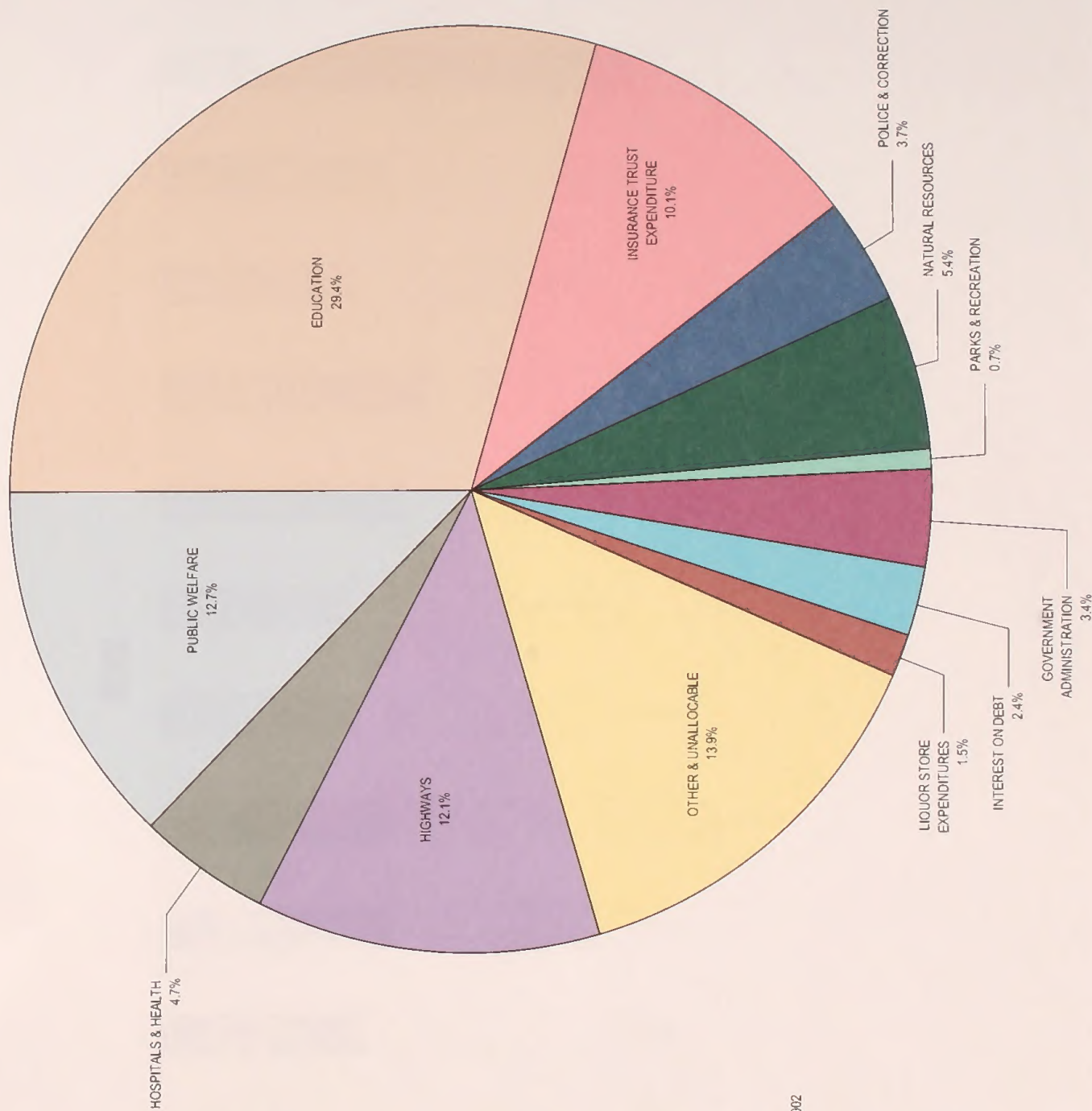


EXPENDITURES BY TYPE \*





# EXPENDITURES BY FUNCTION \*

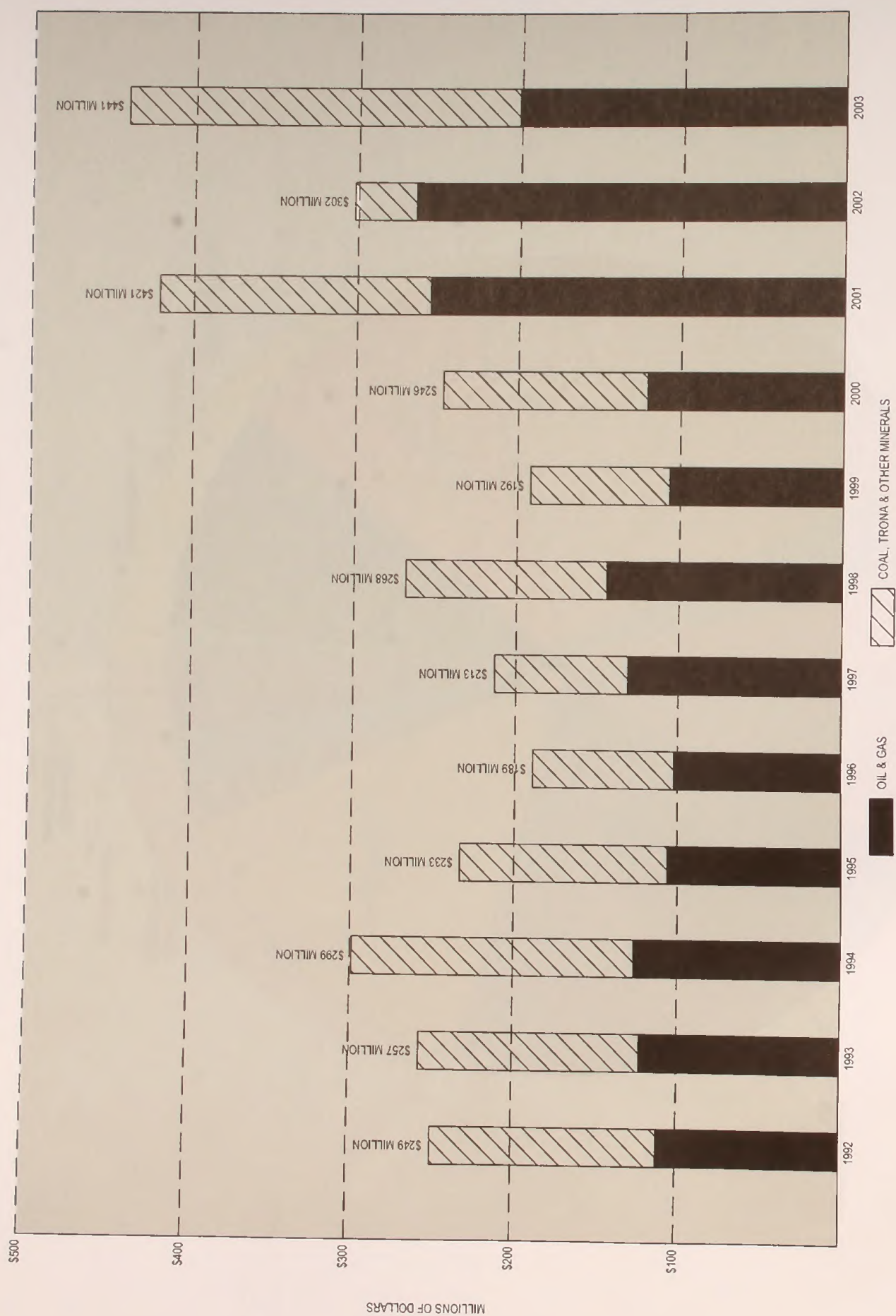


\* EXPENDITURES WERE \$2,948,182,000 IN 2002

SOURCE: U.S. CENSUS BUREAU

Seminole Road Gas Development Project EIS  
**FIGURE 61**  
 WYOMING STATE EXPENDITURES - 2002





# Seminole Road Gas Development Project EIS

FIGURE 62

WYOMING SEVERANCE TAX TRENDS - 1992-2003







### MISSION STATEMENT

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

